Identity Theft and Consumer Payment Choice: Does Security Really Matter?

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Abstract

Security is a critical aspect of electronic payment systems. In recent years, the phenomenon of identity theft has gained widespread media coverage and has grown to be a major concern for payment providers and consumers alike. How identity theft has affected consumer's payment choice is still an open research question. Using a newly available nationally representative survey from the U.S., we study the effect of identity theft incidents on adoption and usage patterns for nine different payment instruments. Our results suggest that specific identity theft incidents alter the probability of adopting cash, money orders, credit cards, stored value cards, bank account number payments and online banking bill payment, after controlling for socio-demographic and payment characteristics. As for payment usage, we observe a positive and statistically significant effect of certain types of identity theft incidents on cash, money orders and credit cards. However, we also find that specific identity theft incidents could decrease the usage of checks and online banking bill payment. These results are robust across different types of transaction after controlling for various socio-demographic characteristics and perceptions toward payment methods.

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1. Introduction

Security is a key feature of any payment system. As the number and value of payment transactions have increased during the last years, security incidents--stealing of cards, counterfeit, skimming and, in particular, identity theft--have become a major concern for payment providers and their clients (Kahn and Roberds, 2008, 2009; Sullivan, 2010).[1] Recent research suggests that perception of payment security may affect the way in which consumers make payment choices.[2] As consumer confidence in specific payment instruments is undermined, they may switch to less efficient forms of payments (Cheney, 2010; Sullivan, 2008, 2010), compromising the smooth operation of payment systems and decreasing efficiency throughout the economy (Crooks, 2004).

In recent years, identity theft has become one of the fastest growing crimes in America, and millions of people become victims each year. The U.S. Federal Trade Commission (FTC) estimated that some 8.3 million people were identity theft victims in 2005 with total losses of $15.6 billion (Conkey, 2007). Although these figures could be considered relatively small for the US economy, the financial damage and *ex-post* economic consequences of identity theft incidents can be severe for both financial institutions and their customers – card reissue costs, customers' out-of-pocket costs, time and effort spent in resolution, legal costs and ultimately expenses associated with changes in payment behavior.[3] As a result, the potential

[1] Most Americans are concerned about payment fraud and this concern supersedes that of terrorism, computer and health viruses and personal safety (Eisenstein, 2008; Federal Trade Commission, 2008; Unisys, 2009).

[2] For example, the AARP Public Policy Institute found that 24 percent of its survey´s respondents always pay restaurant bills with cash rather than a debit or credit card because they are worried about their card being misused (Mayer, 2006). See also Acoca, 2008; Arango and Taylor, 2009; Benton et al., 2007; Bolt and Chakravorti, 2008; He et al., 2008; Jonker, 2007.

[3] See section 2.2 for greater detail.

implications of identity theft have attracted the attention of policy makers, practitioners, and, to a much lesser extent, academic research (Kahn and Roberds, 2008; Linnhoff and Langenderfer, 2004; Schultz, 2005).

Academic research related to the impact of safety incidents on payment behavior is limited (in part due to a lack of publicly available data) and so far provides no conclusive results (Kosse, forthcoming). The issue of safety has been a controversial and much disputed subject within the field of payments. Some research suggests that security matters when a consumer decides to adopt and use payment instruments (Borzekowski et al., 2008; Jonker, 2007). However, other studies find no evidence of security as an important factor affecting paying behavior (Ching and Hayashi, 2010; Schuh and Stavins, 2010). This literature has relied on data based on surveys which include individuals' perceptions of security, but no information on their experience with security incidents.

This paper addresses this shortcoming by investigating whether identity theft incidents translate into consumers' payment behavior. In particular, we analyze the impact of different types of (direct and indirect) identity theft incidents along with consumer's assessment of payment security on adoption and usage of nine payment instruments available in the US market. Our different measures of identity theft capture the effect of safety on payment choice by considering explicitly the potential influence of the consumer's own experiences along with his familiarity with others' identity theft experiences. Including both perception and experience in the analysis has two potential advantages: (i) From the point of view of academic economists, it permits an improved and economically more relevant account of consumer behavior with respect to payment choice, (ii) From the point of view of policy

makers, it helps assess the importance of actual improvements to security on both confidence and trust and ultimately on usage of specific security instruments.[4]

We rely on data from the 2009 Survey of Consumer Payment Choice (SCPC, hereafter) which was designed to produce publicly available, nationally representative data on consumer payment choices in the US. Because this survey includes information about consumer experiences with identity theft as well as perceptions of security, it offers a unique opportunity to test how identity theft incidents have affected adoption and usage patterns of nine payment instruments commonly used in US: four types of paper based instruments—cash (CS), checks (CK), money orders (MO), and traveler checks (TC); three types of payment cards—debit (DC), credit (CC), and stored value cards (SVC); and two types of electronic payment instruments—online banking bill payment (OBBP) and bank account number payments (BANP).[5] The comprehensive scope of the 2009 SCPC permits estimation of Heckman econometric models which correct for potential selection bias in adoption and usage decisions of consumers across all of these payment instruments.

Our results suggest that specific identity theft incidents affect the probability of adopting various instruments after controlling for socio-demographic and payment characteristics. As for payment usage, we observe a positive and statistically significant effect of certain types of identity theft incidents on cash, money orders and credit cards. However, we also find that specific identity theft incidents could decrease the usage of checks and online banking bill payment. These results are robust to different model specifications and five different types of transactions, after controlling for various socio-demographic characteristics and perceptions

[4] Arango and Taylor (2009) also suggest the importance for policy makers of improved understanding of the effects of security on payment choice.

[5] See Appendix I for a description of each payment instrument.

toward payment methods. The magnitude and size of the effect is strongly influenced by the type of identity theft incidents. The fact that we observe friends' experiences of identity theft affecting consumer payment behavior alleviates concern about the potential reverse causality in our results. Overall, our results show that experience of identity theft incidents matters and should be considered when assessing potential fraud costs and payment behaviors.

The paper is organized as follows: Section 2 offers important background information related to definitions of security and identity theft incidents used in this study. Section 3 reviews the relevant literature related to security, identity theft and payment choice. Section 4 describes the data. Section 5 describes the econometric techniques employed to study the impact of identity theft on both adoption and usage patterns of payment instruments. Results are reported in section 6 and the final section summarizes the main conclusions.

2. Relevant background: Mapping the concepts of consumer's assessment of security and identity theft incidents

In an informal sense, the concepts of security in payment and of identity theft are well-understood by the general population. However, the concepts have many possible interpretations from the perspectives of economic theory. It is important therefore to understand how the terms are being used in a particular survey, in order to determine how they link up to more precise legal and economic interpretations. In this section, we describe how the consumer's assessment of security of payment instruments is captured in the 2009 SCPC. Then we turn to the concept of identity theft. After underlining its importance, we examine the legal definition and show that it compares closely with the specific questions and definitions used in the SCPC. Finally, we examine how the incidence of identity theft in our survey compares with figures provided by public sources in the US.

2.1 *Assessment of Security in the 2009 SCPC*

The SCPC provides a comprehensive source of information on consumer payment choice (Foster et al., 2011).[6] It includes consumers' assessments of four characteristics of payment instruments: cost, convenience, security and acceptance. We are particularly interested on consumers' assessments about the security. The 2009 SCPC asked consumers to rate the perceived security of payment instruments based on the following question: "*Suppose a payment method has been stolen, misused, or accessed without the owner's permission. Rate (on Likert scale from 1(low) to 5(high)) the security of each method against permanent financial loss or unwanted disclosure of personal information."*

Security captures to what extent consumers perceive specific payment instruments as secure.[7] Respondents show a higher average security valuation of online banking bill payment (3.02) and cash (2.94) over traditional electronic payment instruments such as debit cards (2.93), credit cards (2.9) and prepaid cards (2.88). This data allows us to describe the overall pattern of consumer's assessment of security with respect to other characteristics in our sample. Figure 1 shows that security is the characteristic of payment instruments that U.S. consumers rated as the most important (54.9% of consumers) over traditional characteristics such as convenience (27.2%), cost (25.2%) and acceptance (22.2%). This figure provides a strong argument in favor of further analysis of security concerns in the payment literature. Figure 2 offers a different angle of analysis about consumers' assessment of security. In particular, cash seems to be considered by consumers a very risky instrument (33.4% of consumers) followed by bank account number payments (25%). Interestingly, 31%

[6] See Appendix II for definitions of payment Instrument characteristics.

[7] One interesting question that could arise as a result of the definition consumer's assessment of security is that it could be influenced by previous identity theft incidents. We examine this issue in Section 4.

of consumers also consider cash as very secure payment instrument, followed by online banking bill payment (15.3%) and prepaid cards (14.5%).[8]

2.2 Identity Theft

Under the Identity Theft and Assumption Deterrence Act (ITADA), "identity theft" is defined as the knowing transfer, possession, or usage of any name or number that identifies another person, with the intent of committing or aiding or abetting a crime. This kind of crime can generate substantial losses to consumers which include the opportunity costs of time spent disputing fraudulent claims, closing existing accounts, and opening new accounts.[9] Still, these may be only part of the costs incurred by the victim (Barker et al., 2008; Eisenstein, 2008). For many consumers, the emotional cost of this highly personal invasion of privacy is the more damaging outcome (Burns and Stanley, 2002). These non-monetary costs are external to the payments system, and thus are in addition to the direct costs borne by the payments institutions in combatting identity theft (Douglass, 2009).

A major impediment to conducting scientific research on identity theft and interpreting research findings has been the variety of ways in which the term is used. This is because a

[8] The peculiar results for cash payments suggest the importance of the composite nature of the question posed: survey respondents are asked to consider *both* financial loss *and* the disclosure of personal information. For most payment arrangements, we expect the two considerations to be correlated. Cash, however, is anonymous, causing the two considerations to work in opposite directions. Those who describe cash as particularly safe are probably emphasizing its privacy as protecting consumer identity (Kahn et al., 2005); those who describe cash as particularly dangerous are probably emphasizing that pieces of currency are indistinguishable, making cash hard to recover if stolen.

[9] Listerman and Romesberg (2009) report that it takes an identity theft victim an average of 58 to 231 hours of personal time to deal with all of the correcting and legal issues. Moreover, in many cases, it takes years to restore the damage done to an individual's credit ruined through fraud (Barker et al., 2008).

considerable number of different crimes may often include the use or abuse of another's identity or identity related factors (Copes et al., 2010; Newman and McNally, 2005). The one aspect which seems to be agreed upon this is that identity theft challenges the trust that supports the payment system (Roberds and Schreft, 2009b). Schreft (2007) suggest two ways in which identity theft challenges the trust that supports the payment system. First, it creates fears of victimization. Second, it reduces the effectiveness of established methods for authenticating transactions and thus the safety and reliability of the payment system. Therefore, identity theft incidents can undermine trust in the payment system and lead people to be less willing to accept for example, checks, credit cards, or debit card. This could generate changes in the payment mix of consumers affecting the smooth operation of the system and the whole economic activity. Ultimately, the negative effects could extend beyond identity theft victims.

Finklea (2010) provides recent figures about identity theft incidents in the US. In 2009 about 11.1 million Americans (that is, about 3.6% of the population) were reportedly victims of identity theft, an increase of about 12% from the number of cases in 2008. The author also shows that the number of overall identity theft complaints generally increased between 2000 and 2008 while the numbers of aggravated identity theft cases filed and defendants convicted have continued to increase. In 2010, the average identity fraud victim incurred a mean of $631 in costs as a result of the fraud—the highest level since 2007. The FTC reports also showed that credit card fraud was the most common form of identity theft (Finklea, 2012).

In this context, the 2009 SCPC provides a good opportunity to explore the extent to which different types of identity theft incidents have affected the motivations and payment behavior of consumers. The 2009 SCPC defines identity theft as follows: *"All types of crime in which someone uses (or attempts to use) someone else's personal information or data without the*

owner's permission to purchase goods or services, make payments, steal money, set up accounts, or commit fraud. Examples of information used include name and address, Social Security number, credit card or debit card number, and other related financial information." This definition contains different concepts but matches with commonly used definitions of identity theft (Schreft, 2007).

There are two advantages of the data about identity theft incidents included in the 2009 SCPC with respect to previous studies. First, it captures identity theft incidents using data from a nationally representative survey. In this way, it can be argued that this data could be more accurate than records in official data based on crime statistics, which could be substantially underreported. Second, the 2009 SCPC allows us to distinguish between direct and indirect exposure to identity theft (Figure 3). In the survey, consumers were asked the question, *"Have you, or anyone you know well (family, friends, neighbors, coworkers, etc.), ever been a victim of what you consider to be identity theft (as defined above)?"* Those who responded in the affirmative (about 36% of our sample, a group we will denote "Type I") were then further subclassified, so that it becomes possible to determine for an individual in the survey whether only he himself has been a victim of identity theft (5% of the sample, "Type IV") or whether only someone he knows has been a victim (21% of the sample, "Type III"). The final category, those who declared that both *"myself and someone I know well have been victims of identity theft"* represents 10% of our sample.

The figure of 15% self-reported victims (Type II plus Type IV) in the sample is much higher than the estimate of 3.6% in the population, as derivable from official statistics for that year (Finklea, 2010). While extensive underreporting of minor incidents of identity theft is the most likely explanation of the difference, we must also acknowledge the possibility that those surveyed have self-reported some incidents which would not meet the standards for

identity theft in official records. Nonetheless, if this were the case it would likely bias the results against our finding of an impact of identity theft on payment behavior.

3. Security concerns and Identity Theft: A review of the payment literature

The payments literature includes both theoretical and empirical investigations of the importance of security of payments. Some theoretical papers have explicitly or implicitly considered the role played by identity theft in the payment system. Kahn et al. (2005) suggest that the use of cash reduces risk by minimizing exposure to dangers like identity theft. Kahn and Roberds (2008) develop a model in which identity theft exists in equilibrium. Not all identity theft is eliminated because the investigation needed to verify a person's identity more thoroughly is too costly (due to the increase in amount of data based transactions) and involves excessive inconvenience and invasion of individual privacy. Roberds and Schreft (2009a) show a trade-off between more efficient payments markets and loss of privacy in equilibrium with non-cooperative networks compared to the efficient allocation. Other papers examine the role of safety by introducing risk of theft (for example, checks) and a safe-keeping role for banks into monetary theory (He et al., 2008).

The empirical literature which links security concerns to payments choice fails thus far to provide a conclusive answer with regard the impact of safety issues on payment behavior (Kosse, forthcoming). From a macroeconomic perspective, Humphrey et al. (1996) find the rate of crime at country level is negatively correlated with debit card usage. Alvarez and Lippi (2009) show that in Italy geographic variation in the demand for cash is linked to variation in the probability of cash theft.

Other studies have relied on survey data to investigate consumers' choice of payment instruments. This literature shows the influence on adoption and usage decisions of

demographic characteristics (e.g. consumer age, gender, and marital status), financial variables (e.g. income, financial responsibility) and perceived characteristics of the payment instruments (e.g. cost, convenience, safety) (Schuh and Stavins, 2010). However, the analysis of the influence of security and card fraud on adoption and usage of electronic payment instruments by consumers remains limited.

Arango and Taylor (2009) find that perceived risk is a strong driver of consumer decisions in payment methods choice. Consumers who perceive cards to be less risky than cash use them more frequently. Arango et al. (2012) show that the fear of fraud at the POS makes cash 7 percentage points more likely to be used. Kosse (2010) shows that the current level of safety and efficiency of the Dutch retail payment system could be maintained or even improved by minimizing the risks of safety incidents occurring and by reducing the consequences. Sproule and Archer (2010) find that 20% of participants in a Canadian Survey of Payments who have been victims of fraud, stopped or reduced online shopping, and 9% have stopped or reduced online banking activities. These findings have implications to the online business industry since the expected benefits for the payment system and the merchant sector could be not realized (Javelin Strategy & Research, 2010). However, other studies find no significant evidence of security as a driver of consumer's payment behavior. Ching and Hayashi (2010) include as explanatory variables security perceptions across payment instruments in their model of payment choice, but they turn out to be insignificant. Finally, Schuh and Stavins (2010) find that the coefficients related to security perceptions play a limited role in consumers' payment choice (adoption and usage decisions).

Cheney (2006) points out that the increase in security-related incidents could have potential negative effects on consumer confidence in electronic payment instruments. If consumer concerns about security translate to behavior seems to be still an open question,

and a great deal of research remains to be done (Anderson et al., 2008). Furthermore, Rysman (2009) points out that there is almost no regression evidence that security matters in the payment choice literature since it is hard to look for empirically. In short, previous empirical work does not provide a strong conclusion as to whether security concerns and safety incidents really influence consumers' choice of specific payment instrument.

This paper adds to the literature in several ways. First, in contrast to previous literature, we empirically study how consumer's risk exposure through identity theft incidents affects payment choice. Second, we are able to analyze the extent to which the identity theft occurring to other individuals influences a consumer's payment behavior. In this particular case, our findings add to recent research about the impact of media reports (i.e. newspaper announcements on debit card fraud) on debit card usage (Kosse, forthcoming). Thus far, this paper is the first that empirically test the relevance of identity theft incidents on payment behavior, taking into account a wide set of payment instruments and transactions types.

4. Data

This paper draws its data from the 2009 SCPC which is a nationally representative survey which includes individual-level information of payment choice in the U.S. (Foster et al., 2011). The 2009 SCPC was administered to a random sample of 2,173 U.S. consumers by the RAND Corporation as a module of the American Life Panel (ALP). Survey responses were weighted to match national population estimates from the Census Bureau's Current Population Survey. The survey includes detailed information about adoption and use of a wide range of payment instruments in addition to a wide set of actions and attitudes to provide a better understanding of consumers' perspectives on their payment choices such as: (*i)* adoption and use of nine different payment instruments, *(ii)* reasons for payment behavior, *(iii)* a wide set of assessments of their payment characteristics and (*iv)* respondent

characteristics such as demographic information, income, financial sophistication along with other relevant factors such as security characteristics and, in particular, information about whether a particular consumer has been involved in different types of identity theft incidents. No other publicly available data contain as much information about identity theft incidents in the area of payment choice.

4.1 Descriptive statistics of our main independent variables

The 2009 SCPC includes a rich set of variables. The socio demographic characteristics and financial indicators used in the regression models are listed and descriptive statistics provided in Table 1. Table 2 summarizes the variables we use describing perceived payment characteristics. The raw data from which these are derived is a set of four self-reported assessments about payment characteristics on an absolute scale of 1–5 for seven of the nine payment instruments, which have been commonly used in the literature to elicit information on the underlying reasons individuals choose to use and adopt payment instruments.[10]

The first characteristic is the assessment of "security". This variable rates the security of each method against permanent financial loss or unwanted disclosure of personal information under the assumption that a payment method has been stolen, misused, or accessed without the owner's permission. The next characteristic is "acceptance". This variable captures the consumer view about how likely each payment method is to be accepted for payment by stores, companies, online merchants, and other people or organizations. The variable "cost" is the evaluation of perceived cost of using the payment instrument: Fees, penalties, postage, interest paid or subscription fees raise the cost; cash discounts and rewards (like frequent flyer miles) reduce the cost of use). Finally, the variable "convenience" includes the

[10] The survey did not ask assessments of characteristics of money orders (MO) and traveller checks (TC).

consumer's subjective assessment about speed, record keeping, control over payment timing, ease of use or set up, ability to keep or store across payment instruments. These characteristics provide a unique source of information about perceived payment method attributes and these can be used to control for unobserved consumer preferences for payment methods, and hence, potentially reducing omitted variable bias.

Following Schuh and Stavins (2010), we convert the raw absolute measures into relative measures of characteristic *k* (security, acceptance, cost, and convenience) of a specific payment instrument *j* with respect to another payment instrument *j** as follows:

$$RCHAR_{k,i}(j,j^*) = log\left(\frac{CHAR_{kij}}{CHAR_{kij*}}\right)$$

Where $RCHAR_{k,i}(j,j^*) > 0$ if instrument j is better than other payment instruments j^* and $RCHAR_{k,i}(j,j^*) < 0$, otherwise. In order to reduce the dimensionality of the data, we compute the average relative characteristic for each payment characteristic over all alternative payment instruments available for consumer *i* as follows.

$$\overline{RCHAR}_{k,i}(j) \equiv \frac{\sum_{j^* \neq j} RCHAR_{k,i}(j,j^*)}{6}$$

Where the *j** is taken over *all* payments instruments (regardless of whether the individual *i* had adopted them) where payment perceptions are available but excluding payment instrument *j* itself.

4.2 Does an identity theft incident affect consumer's assessment of security?

An important issue that may influence the analysis is the possibility that consumer's experience of identity theft could affect his assessment of payment's security. Of course,

security is not only identity theft. A consumer's relative assessments of security could capture a lot of other information about security perceptions across payment instruments. For instance, as we noted above, the relative assessment of security of cash captures how easily cash can be lost or stolen, even though there is little danger of identity theft with cash.

Nonetheless, the identity theft variable measures past experiences with identity theft whereas the assessment of security is in the present. Hence, it could be argued that consumers who experienced identity theft in any of its forms should be rating security of some payment instrument lower because of their experience.

To examine this question we conduct a set of mean-tests of security assessment. Table 3 reports mean test between the two subsamples (victims versus non-victims of identity theft incidents). Results indicate that average relative assessment of security does not appear to be significantly different for cash, checks or payment cards. There is some evidence that the experience of identity theft does change perceptions of safety of electronic banking activities (increasing the perceived safety of online banking bill payment and bank account number payments). For the other more familiar instruments, the results suggest that previous identity theft incidents do not affect how consumers assess that a specific payment instrument is safe enough.[11] This makes it all the more interesting that, as we'll find, identity theft incidents do seem to have a direct and strong effect on consumers' payment behavior (i.e. identity theft incidents undermine consumer's confidence in making transactions in general (e.g. fear to show his wallet or cards in public or information in general) without affect the assessment about how safe is a payment instrument).

[11] Similar results were obtained using raw absolute self-reported assessment of payment characteristics (security, acceptance, cost, and convenience) on a scale of 1–5.

In order to minimize any potential problem associated with the case that perception of security may itself be a function of identity theft experience, we proceed to clean the relative consumer's assessment of security from the incidence of previous identity theft by regressing $\overline{RCHAR}_{security,i}(j)$ on the incidence dummies and replacing the assessment of security by the sum of the intercept and the residuals of the regression. This orthogonalization process ensures that the correlation between the new cleaned assessment of security (called $\overline{RCHAR}^{orthogonal}_{security,i}(j)$), which comprises purely assessment of security characteristics, and identity theft indicators are asymptotically zero.

4.3 Adoption and usage of payment instrument

Table 4 reports the percentage of adopters (i.e. rates of adoption) and use of the nine payment instruments in our sample.[12] The first row contains estimates of adoption for all US consumers. Cash adopters represent about 99.8% of the consumers in our sample, followed by check (85.36%), debit card (77%) and credit card (72.2%) adopters. Bank account number payments adoption was 56.34%, while adoption rates for the other types of payment instruments were below 50%.

Table 4 also reports usage indicators of the nine payment instruments considered in our study. Number of transactions (n_{ijt}) per adopter is measured by respondents' answers to the survey question: "*About how many payments do you make in a typical month with payment instrument j?*" In a similar way to Schuh and Stavins (2010), average shares of use (as percentages) are computed at the individual level for payment adopters only as follow: the number of transactions by consumer *i* using instrument *j* in a typical month (n_{ijt}) as

[12] The definition of adoption in the 2009 SCPC varies across payment instruments. See Appendix A for definitions about adoption.

proportion of all payments made by consumer i (N_i). Hence, the normalized share of a consumer's monthly payments with payment instrument j is $U_{ij} \equiv \left(\frac{n_{ij}}{N_i}\right) \in [0,1]$, where $N_i = \sum_j n_{ij}$ is the number of times consumer i use all their available payment instruments during a typical month. By construction, usage shares sum to 100% for each consumer, regardless of the number of payment instruments held by the consumer. These individual shares are then averaged across all adopters of payment *j*, but they are not weighted to account for the total number of monthly payments made by each consumer. Therefore, usage figures reported in Table 4 should not be interpreted as aggregate share numbers. Consequently, the rows do not sum to 100% because this table is showing share among adopters only. We observe that debit card (35.65%) and cash (28.5%), have the highest average shares in terms of usage. The average share of credit cards (21.90%) is higher than the shares for checks in a typical month: the average credit cardholder makes 15.64 credit card transactions per month compared to the 9.65 check transactions carried out by a check adopter.

The 2009 SCPC asks questions about consumers´ use of their payment instruments for five types of transactions: bill payments; non-bill online payment; and three types of in-person, non-bill payments (retail goods, services and other and person-to-person payments). For each of these transaction types, the SCPC asks the number of payments made with each payment instrument that can be used for that type of transaction.[13] Figures in Table 3 show that most payments are made in-person (retail goods, services and other and person-to-person payments). Approximately, 16.12% of cash transactions (by cash adopters) were made in person for retail goods and 18.10% of debit card transactions (by debit card adopters) were made in person for retail goods (which represents 11.62 transactions per month). We can also

[13] See Appendix B for definitions of Transaction Types.

observe that the most common payment instruments for bill payments were online banking bill payment (6.58 transactions per month), debit card (5.93 transactions per month) and check (3.77 transactions per month).

5. Empirical models of consumer payment choice

The literature has used many different methodologies to analyze payment behavior and concerns can arise about whether different models produce different results. To minimize the issues about whether results are in some way affected by the modeling specification rather than the new data available in the 2009 SCPC, we follow a similar approach to that suggested by Schuh and Stavins (2010) to correct the selection bias that exists between the decisions of usage and adoption of payments instruments.

We model both adoption and usage of payment instruments, to test whether identity theft incidents affect consumer's payment behavior when controlling for other observable characteristics. To the best of our knowledge, this is the first paper to include identity theft incidents in the payment choice modes. One important improvement of the 2009 SCPC with respect to Schuh and Stavins (2010) is that perceptions of payment characteristics (e.g. security) are also available for payment adopters which allows for better estimations of payment behavior.

5.1 Adoption and usage: Heckman two-step selection model

In the standard literature of adoption, consumers must decide whether to bear costs of adoption of a payment instrument, before they can use it. As is usual in Heckman models, exclusions restrictions are needed for adequately identification of the model. That is, some of the covariates from the adoption equations (X_{i1}) should be excluded for the usage equations

(X_{i2}). In the first stage of our estimation process, the adoption of payment instrument *j* by consumer *i* is estimated using a probit specification:

$$\Pr(A_{ij} = 1) = A\left(ID\ THEFT_i, \mathrm{DEM}_i, \mathrm{FIN}_i, X_{i1}, \overline{RCHAR}_{k,i}(j), \overline{RCHAR}^{orthogonal}_{security,i}(j)\right) + \varepsilon^A_{ij}$$

where $A_{ij} = 1$ if consumer *i* has adopted payment instrument *j* and 0 otherwise, and *j* is any of the following: {CSH, CHK, MO, TC, DC, CC, BANP, OBBP} and *k* is any of the following: {acceptance, cost, convenience}.

The independent variables are defined as follows: $ID\ THEFT_i$ is a dummy variable that indicates the extent to which the consumer has been exposed to identity theft incidents (Type I, Type II, Type III and Type IV) as defined in Section 2. DEM_i and FIN_i capture socio-demographic and financial characteristics of consumers, respectively. These variables follow the standard literature of payment choice (Borzekowski et al., 2008; Carbó-Valverde and Liñares-Zegarra, 2011; Hayashi and Klee, 2003; Klee, 2008) and demand for money (Attanasio et al., 2002). These variables are described in detail in Table 1. The independent variables also include a set of indicator variables (X_{i1}), excluded from the usage equation (second stage), which capture the type of financial institution where a particular consumer has her primary bank account. The inclusion of these variables is because different types of financial institutions provide access to different types of payment instruments. Hence, adoption decisions are conditional in some way to the type of payment provider (e.g. credit unions versus internet banks). $\overline{RCHAR}_{k,i}(j)$ is a vector of relative perceptions of payment *j* for consumer *i* as described in the previous section. Finally, we also include the new cleaned assessment of security (called $\overline{RCHAR}^{orthogonal}_{security,i}(j)$), which comprises purely consumer's assessment of security.

Once a consumer adopts a payment instrument, the second step is to estimate the level of usage of payment instruments (conditional to adoption). We measure use of a given payment instrument *j* by a consumer *i* as a share of all transactions conducted by the consumer in a given month as explained in Section 4.2. The second stage of our empirical model follows this specification:

$$U_{ij} = U\left(ID\ THEFT_i, \mathrm{DEM}_i, \mathrm{FIN}_i, \widetilde{NUM}_{ij}, \overline{RCHAR}_{k,i}(j)_i, \overline{RCHAR}^{orthogonal}_{security,i}(j), \lambda_i^{-1}\right) + \varepsilon_{ij}^{U}$$

The independent variable 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. The second stage explanatory variables include both adoption covariates and two additional variables: the number of other adopted payment instruments by consumer *i* instruments excluding instrument *j* ($\widetilde{NUM}_{ij}$). This variable controls how the availability of alternative payment instruments affects usage decisions of the payment instrument under analysis. The second variable (λ_i^{-1}) is the inverse Mills ratio, computed from the adoption equation, which corrects selection bias. A statistical significant coefficient of λ_i^{-1} shows a likely simultaneity bias of joint adoption and use decisions and Heckman estimation is required. If the inverse Mills ratio is not significant, the coefficients in the usage equations might be unbiased.

In all models, standard errors have been clustered by the respondent´s state of residence because unobserved shocks affecting adoption and usage decisions of consumers are likely to be correlated among consumers within a certain state. The correlation between the independent variables used in our empirical models is low. We used the Variance inflation factor (VIF) value to assess multi-collinearity between the independent variables used in our empirical models. VIF scores suggest that multi-collinearity is not a problem, since mean VIF is below 1.6.

6. Econometric results

In this section, we summarize the results for the models described in section 5. All our adoption and usage regressions for each payment instrument include two empirical models: The first one includes as our key independent variable an indicator variable which accounts for consumers which have been involved in identity theft incidents in any of their forms (Type I victims). The second model includes simultaneously three indicator variables which classify consumers into Type II, Type III and Type IV victims as stated in Section 2. It should be noted Type II, Type III and Type IV indicator variables are mutually exclusive; so that they can be included jointly in the second models.

6.1 Adoption and usage models: General results

Table 4 shows the results of the first-stage (adoption) and second-stage (usage) regressions. Table entries in adoption regressions are the average marginal effects estimates from the probit regression in the first stage of the Heckman selection model. Panel A reports results for paper based instruments (cash, check, money order and traveler check), Panel B includes results for payment cards (debit card, credit card and stored value card) and Panel C includes electronic payment instruments (bank account number payments and online banking bill payment). In general, identity theft incidents seem to have a positive and statistically significant effect on adoption of cash, money orders, credit cards, stored value cards, bank account number payments, and online banking bill payment. As for usage levels, results suggest that identity theft incidents could have a positive incidence on cash, money order, credit cards. However, we observe a negative influence on usage of checks and online banking bill payment. We will explore and quantify these results, from an economic perspective, in the next subsection.

As for our control variables, the effects of the demographic, financial and payment characteristics in the adoption and usage models are consistent with results from the previous studies. Coefficients on the relative payment characteristics should be positive. Consumers who rate the characteristic of a payment instrument relatively higher should have higher use/adoption of the specific payment instrument. For example, in panel B, we observe that credit card adoption increases with respect to education level and the subjective assessment about convenience, cost and acceptance with respect to other payment instruments. However, it seems that usage levels of credit cards is negatively affected by other payment adopted payment instruments and lower levels of income.

In each of our models, we test three null hypotheses: First, Ho: $\beta_2 + \beta_3 = 0$ (having a friend-victim of identity theft (Type II and Type III individuals) doesn't affect consumer´s payment behavior), Second, Ho: $\beta_2 + \beta_4 = 0$ (to be a victim of identity theft oneself (Type II and Type IV individuals) doesn't affect consumer´s payment behavior). In most of the cases, we reject the hypothesis that the sum of the two coefficients is zero. The results support our previous findings about the direct (self-victim) and indirect (friend victim) effect of identity theft incidents on payment behavior, even when controlling for demographic, financial, and perception variables. Tests of the first hypothesis are useful for reducing concerns about endogeneity (e.g. reverse causality) of the experience of identity theft incidents. Finally, in most of the regression models where some statistically significant coefficients related to identity theft incidents occur, the null hypothesis Ho: $\beta_2 = \beta_3 = \beta_4$ is rejected. It suggests that different types of identity theft incidents have a differentiated impact (i.e. a different size effect) on payment behavior. In addition, the Wald tests demonstrate the overall significance of our empirical models ($p<0.01$).

6.2 The impact of identity theft on Adoption and usage models: welfare analysis

In order to provide an economic interpretation of our results, we use the estimated coefficients of our regressions to estimate changes in the payment composition of consumers.[14] We attempt to simulate how specific types of identity incidents change the adoption (in terms of probability to adopt a payment instrument) and usage (in terms of transactions per month) patterns of payment choice. To do this, we extract from Table 4 the statistically significant coefficients related to identity theft incidents in order to estimate changes in payment behavior.

Figure 4 reports simulated effects of identity theft incidents on the probability to adopt payment instruments at individual level. Baseline estimates refer to the average adoption rate observed in our sample (see Table 2). Cash is not included in the graph since the average adoption rate in our sample is 99.8% and the expected marginal increase after an identity theft incident is marginal from an economic perspective. We find that the higher impact of identity theft incidents are for type II victims which could increase the probability of adopting a store value card in 11.6% (from 32.34% to 43.92%). This marginal effect on adopting store value cards is also substantial for Type III (8.8%) and Type I (7.9%) identity theft victims. Our results also suggest that Type II victims have a more probability to adopt money orders (from 25.31 to 31.74%) and online banking bill payment (from a baseline of 48.75% to 55.28%). Moreover, Type III victims have a 6% higher probability to increase adoption of bank account number payments with respect to non-victims. Finally, the observed marginal effect on the adoption of credit cards by type II victims is lower than the other instruments

[14] Although the significant effects could be economically small at consumer level, the aggregate effects could be substantial.

(4.5%); however, the baseline adoption rate is the higher with respect to other payment instruments.

The positive effect on adoption could be also explained by new ways of protection linked to payment instruments that shield consumers from most of the direct monetary losses when fraud takes place, along with improved systems that help customers keep track of both transactions and balances. While some consumers are protected from direct losses arising from different forms of payment fraud (not exclusive related to identity theft incidents), the costs to victims can be substantial (non-monetary losses in addition to the losses resulting from the fraudulent transactions) and could be changing their preferences towards specific payment instruments.[15]

In terms of usage, we report simulated effects of identity theft incidents on the number of transactions per year. Baseline estimates are average number of transactions per year extrapolated using figures reported in Table 2. We find a positive and statistically significant effect of type III incidents on cash usage (9.32 additional cash transactions per year with respect to the average usage level). These results give empirical support to the argument that consumers may appreciate the anonymity of cash for privacy reasons (Kahn et al., 2005), in particular, who have been victims of identity theft. Type I and III exert a positive effect on Money orders usage (24.57 and 10.04 additional transactions per year with respect to the average usage level, respectively), and Type I, Type II and Type IV on credit cards (24.10, 46.40 and 28.57 additional transactions per year with respect to the average usage level, respectively). This result allows us to generate some hypotheses. For example, the role played by moral hazard among credit cardholders, by considering that cardholder's laws provide

[15] Furletti and Smith (2005a, 2005b) examine in detail the federal and state laws that protect consumers in case of debit and credit fraud as well as the relevant association, network, and bank policies that may apply.

important coverage in case of fraud in spite of the potential risks. In general, U.S. law prevents consumers from being held responsible for more than $50 in fraudulent charges. However, all the major credit card networks provide zero liability to cardholders in cases of fraudulent payments (Sullivan 2010; Anderson et al., 2008; Furletti and Smith 2005a,b). This turns out to be an important political issue considering that providing consumers with insurance to cover their out-of-pocket expenses resulting from identity theft makes them more likely to engage in behaviors that risk compromising their identity (Bolton et al. 2006).

On the other hand, being a Type II victim could reduce in 22 the number of check transactions in a particular year. The negative result on check use among identity theft victims could have an intuitive explanation: when consumers pay with checks, they are handing a piece of information with their name, address, account numbers and a copy of their signature to a stranger. Hence, trust in the use of checks could be a significant problem, in particular, when the consumer has been victim of identity theft in the past. Hence, this result could also contribute to explain the move away from checks observed during the last years as documented by Schuh and Stavins (2010). Similar results are found in Type I, Type III and Type IV victims on the usage of online banking bill payment (their number of transactions per year is expected that decrease in 11.40, 11.49 and 23.70 respectively). In general, marginal effects of identity theft vary significantly depending on the type of incident and the type of payment instrument. These results are particularly relevant since payment systems can only survive if they keep fraud to a manageable level due to it would be prohibitively expensive to eliminate it entirely (Kahn and Roberds, 2008).

6.3 Robustness checks: Analysis by type of transactions

As a robustness check, we test the impact of identity theft on payment usage across different transaction types. We consider five groups of payment transactions: bill payments;

non-bill online payment; and three types of in-person, non-bill payments: retail goods, services and other and person-to-person payments. For each of these types of transactions, the 2009 SCPC offers detail quantitative information about the number of payments made in a typical month by consumers. Results in this Section are based on the same empirical model as the previous section.[16] Next, we present the main results.

Figure 6a and 6b show the simulated effect of identity theft incidents on the usage (number of transactions) of payment instruments (by type of transaction) per year. We only report statistically significant marginal effects obtained in the second step of our selection models. Baseline figures refer to the annualized number of transactions using the data in Table 2. Results suggest that identity theft incidents have a statistically significant positive effect on cash, money orders and credit card usage. Moreover, we find a statistically significant negative effect on check and online banking bill payment usage. It provides support to our previous findings.

In terms of cash payments, we observe that type IV victims increase his cash use for retail transactions in approximately 9.4 additional transactions per year. Perhaps, anonymity provided by cash transactions could be behind of this result. Check adopters seem to reduce considerable the use of checks after identity theft incidents. This result merits further investigation as a part of the explanation for the move away from checks in the US (Schuh and Stavins 2010). We find that Type II victims reduce the average number of bill payments per year from 45.30 to 30.01 (it represents approximately a reduction of 15 transactions per year per victim). A similar pattern is observed in payments of services, where Type I, Type

[16] Appendix III shows the regression results obtained in the second step of our selection models. The Table only reports the key variables of interest associated with identity theft incidents. Covariates remain the same as the previous section, but are not reported to save space. Results are available upon request from the authors.

III and Type IV victims have reduced in 4.8, 4.8 and 5.2 the number of check's transactions per year, respectively.

As for money order adopters, we find that type II victims have increased in 15.3 the number of money order's transactions to pay bills per year. Moreover, the use of money order for online payments seems to increase by Type II victims (from a baseline of 5.77 transactions per year to 19.54). This result is particularly relevant because online bill payment and online banking are the payments methods that are most likely to be avoided due to privacy or security concerns (AARP, 2007). P2P payments (e.g. payments for babysitting or allowances, paying a person for something that is not business related, and account-to-account payments from one person's bank account to another person's bank account) seems to be also influenced by identity incidents. We find that Type I, Type II and Type III victims could increase in 5.53, 18.85 and 2.46 the number of money order transactions per year, respectively.

Results in Figure 6b show that credit card adopters are also driven by identity theft incidents. We observe that Type II and Type IV victims can increase the use of their credit cards to pay bills in 15.6 and 11 transactions per year, respectively. Type II victims could increase the number of online payments in 9 transactions per year. We also find that Type I and Type III victims could increase the number of retail transactions per year in 11.78 and 12.98, respectively.

Finally, results suggest that the use of online banking bill payment to pay bills could decrease after an incident of identity theft. In particular, we observe that Type I, Type III and Type IV victims could reduce in 12.59, 13.15 and 23.47 the number of bill transactions using online banking bill payment per year, respectively.

7. Conclusions

Security issues have become a major concern for the public and payment providers. The industry has already made considerable efforts to ensure security for payment transactions, considering their rapid growth during the last years. In this scenario, economists, regulators and the payment industry have been interested in understanding how security affects adoption and usage decisions of consumers. In a fundamental economic sense, security could affect consumers' expectations of the cost and benefits of adopting and using payment instruments. Hence, there is a natural interest in understanding how security affects payment decisions. However, there is little empirical evidence if these concerns translate to behavior up to now. This paper has addressed this concern by studying how identity theft incidents have affected adoption and usage patterns of nine payment instrument used for paying in five different types of transactions.

Regarding adoption, our results suggest a positive and statistically significant effect of *specific* identity theft incidents on the probability of adopting cash, money orders, credit cards, stored value cards, bank account number payments and online banking bill payment, after controlling for socio-demographic and payment characteristics. As for payment usage, we observe a positive and statistically significant effect of certain types of identity theft incidents on cash, money orders and credit cards. However, we also find that specific identity theft incidents could decrease the usage of checks and online banking bill payment. These results are robust across different types of transaction after controlling for various socio-demographic characteristics and perceptions toward payment methods.

All in all, results may be useful in helping to understand determinants of payment behavior, and effects of increased effectiveness of security and anti-fraud measures on payment's usage and adoption (e.g. to promote payment systems that are safe to use and

protect against fraud and identity theft, which could increase consumer confidence and minimize the potential of big economic disruptions). Also, the results leave room for additional policy discussions about the effectiveness of measures taken to control fraud along with possible opportunistic behavior of credit card users (a moral hazard problem that arise if consumers have no risk of loss due to fraudulent transactions) that may arise in the payment system. As noted by Douglass (2009), the current public law regimes and private card network rules may fail to create appropriate incentives to cardholders, merchants, and card issuers to adopt fraud-reducing practices. Hence, our findings are also important in terms of regulation considering that the ultimate goal of regulation should not be absolute privacy of consumers or complete suppression of identity theft, but instead the promotion of efficient confidentiality of personal information.

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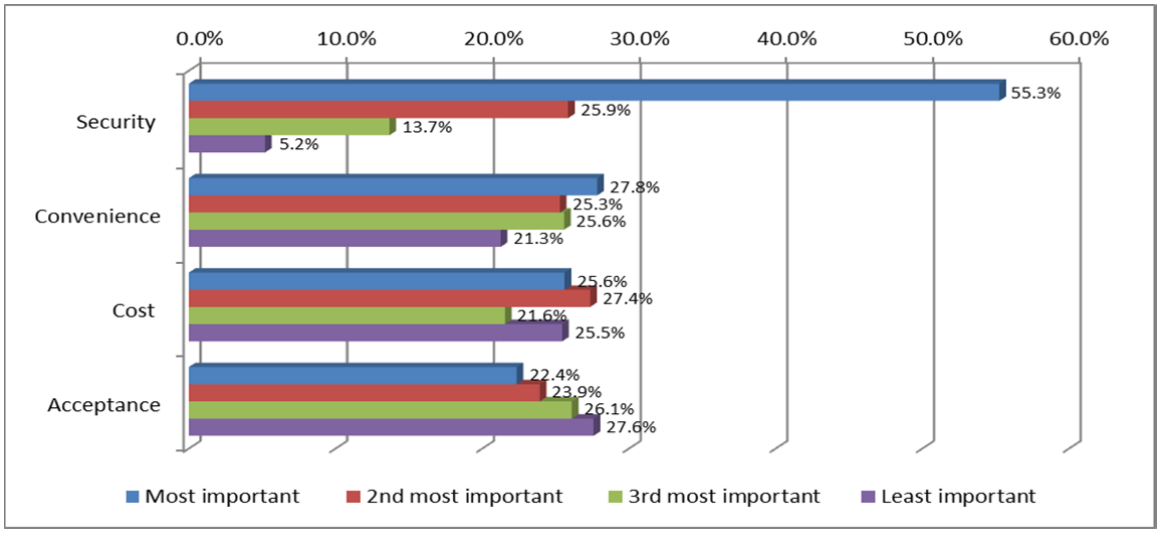
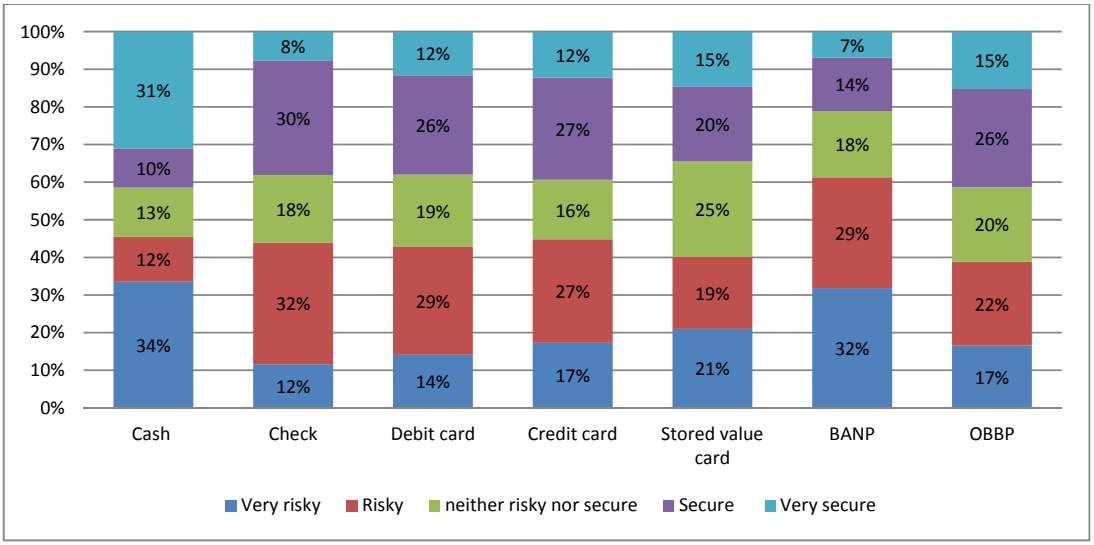
Figure 1. Assessments of Characteristics of payment Instruments (Percentage of consumers)



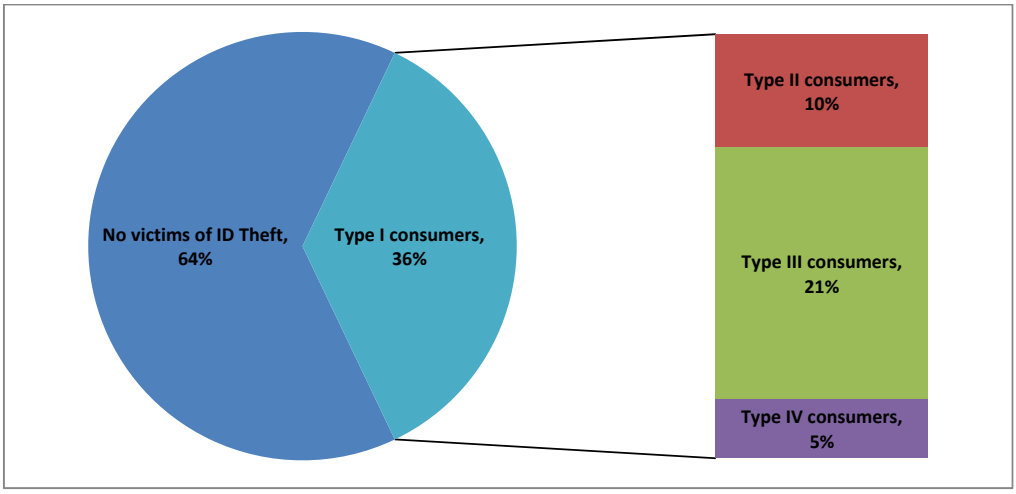
Note: This table shows how important are characteristics of payment Instruments to consumers when decide which payment method to use.
Source: 2009 Survey of Consumer Payment Choice (SCPC) and own elaboration.

Figure 2. Assessments of payment instruments in terms of perceived security (Percentage of consumers)



Note: This figure captures the consumer's subjective assessment of security (from very risky to very secure) of each payment method against permanent financial loss or unwanted disclosure of personal information in case the payment method has been stolen, misused, or accessed without the owner's permission. OBBP refers to online banking bill payment and BANP refers to bank account number payments.
Source: based on 2009 Survey of Consumer Payment Choice (SCPC).

Figure 3. Identity Theft incidents
(Percentage of consumers)



Note: The Figure shows the percentage of consumers who have been involved in different types of identity theft incidents. Type I consumers include consumers who responded positively to the following question: *Have you, or anyone you know well (family, friends, neighbours, co-workers, etc.), ever been a victim of what you consider to be identity theft?* Among this group, we are able to distinguish between three mutually exclusive groups of consumers: Type II (if they responded *YES to the following question* "*myself and someone I know well have been victims of identity theft*"), Type III consumers (if they responded *YES to the following question, "someone I know well only has been victim of identity theft"*) and Type IV consumers (if they responded *YES to the following question, "myself only"*).
Source: 2009 Survey of Consumer Payment Choice (SCPC) and own elaboration.

Table 1. Summary statistics

	Mean	Standard Error	Min	Max	Observations
SOCIO-DEMOGRAPHICS					
Age	45.51	0.62	18	90	2172
Sex (male=1)	48.3%		0	1	2173
Education level [(1)]	2.85	0.04	1	5	2173
Marital Status (single=1)	19.8%	-	0	1	2173
Currently working (Yes=1, No=0)	77.2%	-	0	1	1977
FINANCIAL VARIABLES					
Income per year					2167
Under $25,000	18.3%		0	1	
$25,000 - $49,000	33.7%		0	1	
$49,001 - $74,999	23.4%		0	1	
$75,000 - $99,999	12.4%		0	1	
Greater than $100,000	12.1%		0	1	
Type of main payment provider [(2)]					2086
Commercial Bank	70.3%		0	1	
Savings and loan & Credit union	26.9%		0	1	
Brokerage, Internet banks and others	2.8%		0	1	
Number of Payment instruments					
Number of adopted payment instruments	5.05	0.06	1	9	2165

Source: 2009 Survey of Consumer Payment Choice.
Notes: (1) "Education level" is a categorical variable, which ranges from 1 to 5 in the following order: Less than High School; high school; some college; college; post-graduate studies. (2) The set of dummy variables under the group "type of main payment provider" defines the type of financial institution where a particular consumer has her primary bank account.

Table 2. Average relative payment characteristics ($\overline{RCHAR}_k(j)$) across consumers

	***k* = security**	***k* = acceptance**	***k* = cost**	***k* = convenience**
***j*=CSH**	-0.043 (0.027)	0.269 (0.012)	0.269 (0.012)	0.131 (0.014)
***j*=CHK**	0.07 (0.013)	0.089 (0.013)	0.091 (0.01)	-0.115 (0.013)
***j*=DC**	0.065 (0.013)	0.204 (0.009)	0.092 (0.009)	0.182 (0.009)
***j*=CC**	0.037 (0.014)	0.241 (0.009)	-0.476 (0.019)	0.194 (0.009)
***j*=SVC**	0.018 (0.018)	0.041 (0.011)	-0.074 (0.013)	-0.052 (0.016)
***j*=BANP**	-0.234 (0.015)	-0.567 (0.021)	0.015 (0.011)	-0.317 (0.017)
***j*=OBBP**	0.086 (0.016)	-0.098 (0.014)	0.082 (0.011)	-0.023 (0.013)

Source: 2009 Survey of Consumer Payment Choice. This table shows average (across consumers) relative measures of characteristic *k* (security, acceptance, cost, and convenience) of a specific payment instrument *j* with respect to all others payment instruments. Payment instruments are classified as follows: four types of paper based instruments—cash (CS), checks (CK), money orders (MO), and traveler checks (TC); three types of payment cards—debit (DC), credit (CC), and stored value cards (SVC); and two types of electronic payment instruments—online banking bill payment (OBBP) and bank account number payments (BANP).Standard errors are included in parentheses.

Table 3. Assessment of Security across payment instruments by type of Identity Theft incidents

	$\overline{RCHAR}_{security,i}(j)$						
	j=CSH	**j=CHK**	**j=DC**	**j=CC**	**j=SVC**	**j=BANP**	**j=OBBP**
Non -Victim	-0.09	0.10	0.04	0.05	0.01	-0.23	0.13
Type I Victim	-0.07	0.10	0.04	0.06	-0.02	-0.26	0.15
T-statistic of the mean test	-0.64	-0.46	-0.06	-0.52	1.02	1.68*	-0.94
Non-Victim	-0.09	0.10	0.04	0.05	0.01	-0.23	0.13
Type II Victim	-0.16	0.12	0.03	0.07	-0.05	-0.22	0.21
T-statistic of the mean test	1.24	-0.91	0.26	-0.45	1.48	-0.23	-2.34**
Non-Victim	-0.09	0.10	0.04	0.05	0.01	-0.23	0.13
Type III Victim	-0.05	0.09	0.05	0.06	-0.01	-0.27	0.12
T-statistic of the mean test	-1.25	0.18	-0.40	-0.25	0.52	1.69**	0.05
Non-Victim	-0.09	0.10	0.04	0.05	0.01	-0.23	0.13
Type IV Victim	-0.04	0.12	0.03	0.07	0.00	-0.31	0.13
T-statistic of the mean test	-0.85	-0.62	0.37	-0.51	0.15	1.82**	-0.04

Source: 2009 Survey of Consumer Payment Choice. Notes: Consumers who responded positively to the question "Have you, or anyone you know well (family, friends, neighbors, coworkers, etc.), ever been a victim of what you consider to be identity theft?" have been classified as Type I victims. Type II victims declared that "they have been victims of identity theft as well as they know other victim". Type III victims declared that "someone they know well has been victim of identity theft". Type IV victims has been directly involved in an identity theft incident. T-statistics test for the null: "Assessment of security is not different for victims and non-victims of identity theft incidents". ∗∗∗,∗∗ and ∗ indicate significance, respectively, at the 1%, 5% and 10% levels for a bilateral test.

Table 4. Average adoption and usage rates per adopter of Payment Instruments in a Typical Month (by type of instrument and transaction)

			Cash	Check	Money order	Travelers check	Debit Card	Credit card	Prepaid card	BANP	OBBP
Adoption	**All sample**	**Percentage of adopters**	99.84	85.36	25.13	3.47	77.03	72.17	32.34	56.34	48.75
Usage	**All sample**	***Number of transactions (n_{ijt})***	18.42	9.65	2.15	0.19	24.78	15.64	2.56	5.36	6.85
		Share (%)	*28.50*	*16.54*	*6.73*	*0.37*	*35.65*	*21.90*	*4.65*	*10.02*	*10.81*
Usage	**Bill Payments**	***Number of transactions (n_{ijt})***	2.12	3.77	1.07	na	5.93	3.64	0.51	3.81	6.58
		Share (%)	*3.75*	*7.25*	*0.03*	*na*	*8.62*	*5.13*	*1.03*	*7.51*	*10.59*
	Online Payments	***Number of transactions (n_{ijt})***	na	1.57	0.48	na	2.38	1.20	0.37	1.25	na
		Share (%)	*na*	*2.62*	*0.02*	*na*	*3.21*	*2.32*	*0.72*	*2.20*	*na*
	Retail payments	***Number of transactions (n_{ijt})***	10.00	2.16	0.27	na	11.62	7.38	1.22	na	na
		Share (%)	*16.12*	*3.40*	*0.01*	*na*	*18.10*	*10.81*	*2.36*	*na*	*na*
	Services and others	***Number of transactions (n_{ijt})***	5.17	1.92	0.28	na	5.13	3.33	0.63	na	na
		Share (%)	*6.99*	*3.03*	*0.01*	*na*	*6.30*	*4.13*	*0.86*	*na*	*na*
	P2P	***Number of transactions (n_{ijt})***	1.88	0.57	0.17	na	0.56	0.18	na	0.40	0.44
		Share (%)	*2.78*	*0.80*	*0.00*	*na*	*0.56*	*0.28*	*na*	*0.47*	*0.47*

Note: The definition of adoption in the 2009 SCPC varies across payment instruments: cash, debit card, credit card, stored value card and online banking bill payment (OBBP) adopters must have currently the payment instrument. A check, money order, traveler check and bank account number payments (BANP) adopter are defined as having the instrument or using the instrument in a typical year. Share is calculated as the number of monthly payments made with each instrument divided by the total number of monthly payments made with all nine payment instruments. These individual shares are then averaged across *all adopters* of that payment type, but they are not weighted to account for the total number of monthly payments made by each consumer. Therefore, these numbers should not be interpreted as aggregate share numbers. The rows do not sum to 100 because this table is showing share among adopters only. The notation "na" indicates that these particular figures are not available in the 2009 SCPC.

Table 5. Heckman two-step estimation results. The impact of identity theft incidents on payment choice

PANEL A. PAPER BASED INSTRUMENTS

	Cash				Check				Money Order				Traveler Checks			
	Model 1		Model 1a		Model 2		Model 2a		Model 3		Model 3a		Model 4		Model 4a	
	Usage	Adoption	Usage	Adoption	Usage	Adoption	Usage	Adoption	Usage	Adoption	Usage	Adoption	Usage	Adoption	Usage	Adoption
ID THEFT INDICATORS																
Type I (β_1)	0.01	7.87e-05***			-0.01	0.01			0.06***	0.02			-0.00	0.02		
Type II (β_2)			0.00	7.85e-05**			-0.03***	0.02			0.39	0.07*			-0.00	0.00
Type III (β_3)			0.01**	7.45e-05**			-0.01	0.02			0.03*	0.00			-0.00	0.01
Type IV (β_4)			0.00	4.61e-05*			-0.01	-0.01			-0.00	0.00			0.00	0.03
SOCIO DEMOGRAPHICS																
Age	0.00	-1.50e-05***	0.00	-1.42e-05**	0.00	0.01**	0.00	0.01**	0.03***	0.01***	0.06***	0.01**	0.00	0.00	0.00	0.00
Age^2	-0.00	2.18e-07***	-0.00	2.06e-07**	-0.00	-0.00	-0.00	-0.00	-0.00***	-0.00***	-0.00***	-0.00***	-0.00	0.00	-0.00	0.00
Sex (male=1)	0.06***	-1.24e-05	0.06***	-1.14e-05	-0.01*	-0.02	-0.01*	-0.02	0.04**	0.01	0.08***	0.01	0.00	-0.01	0.00	-0.01
Education level	-0.01***	2.07e-05*	-0.01***	2.01e-05	-0.00	0.03***	-0.00	0.03***	-0.04***	-0.01	-0.06***	-0.01	-0.00	0.01**	-0.00	0.01*
Marital Status (single=1)	0.04***	1.09e-04***	0.04***	1.06e-04***	-0.03**	-0.03**	-0.03**	-0.03**	0.07***	0.01	0.09***	0.01	0.00	-0.02	0.00	-0.02
Currently working (Yes=1)	-0.00	2.78e-06	-0.00	2.93e-06	0.01	-0.03	0.01	-0.03	0.06***	0.02	0.10***	0.02	-0.01	0.02*	-0.00	0.02
FINANCIAL VARIABLES																
Income per year[$]																
Under $25,000	0.08***	-1.55e-03**	0.08***	-1.61e-03***	0.01	-0.06**	0.01	-0.06*	0.28***	0.10**	0.50***	0.10**	0.00	-0.03**	0.00	-0.03*
$25,000 - $49,000	0.02***	-7.57e-03***	0.02**	-7.98e-03***	0.01	-0.02	0.01	-0.02	0.15***	0.05	0.28***	0.05	0.00	-0.02	-0.00	-0.02
$75,000 - $99,999	-0.00	-9.38e-04	-0.00	-1.02e-03	-0.02	-0.01	-0.02	-0.01	-0.28***	-0.07***	-0.52***	-0.07***	0.00	-0.02	-0.00	-0.02
Greater than $100,000	0.01	-2.17e-03	0.01	-2.48e-03	-0.02**	-0.00	-0.02**	-0.00	-0.18***	-0.05**	-0.34***	-0.05**	-0.00	-0.00	-0.00	-0.01
Number of Payment instruments																
$\overline{NUM}_{iJ}$	-0.02***		-0.02***		-0.04***		-0.04***		-0.02**		-0.02**		-0.00		-0.00	
Payment provider[$]																
Commercial Bank		6.19e-03		6.43e-03		0.09		0.09		-0.01		-0.00		0.04***		0.04***
Credit Union		-9.11e-04		-9.64e-04		0.08		0.08		-0.01		-0.00		0.06***		0.06***
PAYMENT CHARACTERISTICS																
$\overline{RCHAR}_i$ Acceptance	-0.02	-1.00e-04*	-0.02	-9.58e-05	0.04***	0.01	0.04***	0.00								
$\overline{RCHAR}_i$ cost	0.01	7.73e-05***	0.01	7.52e-05***	0.02	0.01	0.02*	0.02								
$\overline{RCHAR}_i$ convenience	0.07***	2.12e-05	0.07***	2.15e-05	0.11***	0.06***	0.11***	0.06***								
$\overline{RCHAR}_{i_{security}}^{orthogonal}$	0.01***	-1.13e-05	0.01***	-1.15e-05	0.01	0.01	0.01	0.01								
Constant	0.24***		0.24***		0.28***		0.28***		-1.78***		-3.39***		0.04		0.04	
H_o: $\beta_2 + \beta_3 = 0$			0.73	21.17***			4.67**	1.19			19.37***	4.51**			0.00	0.53
H_o: $\beta_2 + \beta_4 = 0$			0.01	10.24***			3.34*	0.20			15.20***	3.62*			0.00	1.31
H_o: $\beta_2 = \beta_3 = \beta_4$			0.77	0.76			3.58*	0.64			16.23***	6.18**			0.03	1.79
Observations	1,846		1,846		1,853		1,853		1,877		1,877		1,884		1,884	
Wald Test (chi-squared)	474.5***		1780***		860.8***		638.9***		89.7***		290.7***		42.99***		6049***	
Inverse of Mill's ratio (λ_i^{-1})	101490		126645		-0.0357		-0.0412		0.975***		1.831***		-0.017		-0.015	

Source: 2009 Survey of Consumer Payment Choice.

Notes: Table entries for adoption are the marginal effects estimates from the Probit regression in the first stage of the Heckman 2-step procedure. The dependent variable is set equal to 1 if the respondent has adopted the payment type. Otherwise, it equals zero. Table entries for usage are coefficient estimates from the second stage of the Heckman selection model. The dependent variable is the share of total payments made with that payment type. The Heckman 2-step procedure excludes respondents that have missing values in the second stage only if the dependent variable of the first stage is equal to 1, i.e. they had adopted the payment method. [$]The excluded variables for the financial categories above are as follows: Brokerage, Internet bank and others (payment provider) and $50,000–$74,999 (income). *, **, *** indicate that the estimates are statistically different from zero at 0.10, 0.05, and 0.01 probability levels.

PANEL B. PAYMENT CARDS

	Debit Card				Credit Card				Stored Value Card			
	Model 5		Model 5a		Model 6		Model 6a		Model 7		Model 7a	
	Usage	Adoption	Usage	Adoption	Usage	Adoption	Usage	Adoption	Usage	Adoption	Usage	Adoption
ID THEFT INDICATORS												
Type I (β_1)	-0.01	-0.01			0.03***	0.02			-0.01	0.08***		
Type II (β_2)			-0.02	-0.02			0.05***	0.05**			-0.02	0.12***
Type III (β_3)			-0.01	-0.01			0.02	0.01			-0.01	0.09***
Type IV (β_4)			-0.00	0.01			0.03***	0.01			-0.00	-0.01
SOCIO DEMOGRAPHICS												
Age	-0.00	-0.01**	-0.00	-0.01*	-0.00	0.00	-0.00	0.00	-0.00	0.00	-0.00	0.00
Age^2	-0.00	0.00	-0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.00	0.00	-0.00
Sex (male=1)	-0.03**	-0.02*	-0.03**	-0.02	-0.00	-0.03**	-0.00	-0.03**	0.00	-0.01	0.00	-0.01
Education level	-0.03***	-0.01	-0.03***	-0.01	0.05***	0.05***	0.05***	0.05***	-0.01	0.02***	-0.01	0.02***
Marital Status (single=1)	-0.02	-0.05**	-0.02	-0.05**	0.02*	0.01	0.02*	0.01	-0.00	-0.00	-0.00	-0.00
Currently working (Yes=1)	0.05**	-0.04**	0.05***	-0.04**	-0.04**	0.01	-0.04**	0.01	-0.01	0.04	-0.01	0.04
FINANCIAL VARIABLES												
Income per year[$]												
Under $25,000	-0.02	0.03	-0.02	0.03	-0.09***	-0.17***	-0.09***	-0.17***	-0.01	0.10***	-0.02	0.11***
$25,000 - $49,000	-0.00	0.05**	-0.00	0.05**	-0.05***	-0.07***	-0.05***	-0.07***	-0.01	0.09***	-0.02	0.09***
$75,000 - $99,999	0.00	0.01	0.00	0.01	0.04***	0.04**	0.04**	0.05*	-0.01	0.04	-0.02	0.04
Greater than $100,000	-0.06***	0.01	-0.06***	0.01	0.05***	0.05**	0.05***	0.05**	-0.01	0.05**	-0.01	0.06**
Number of Payment instruments												
$\overline{NUM}_{ij}$	-0.02***		-0.02***		-0.02***		-0.02***		0.00		0.00	
Payment provider[$]												
Commercial Bank		0.00		0.00		0.05*		0.05*		-0.09		-0.09
Credit Union		0.01		0.01		-0.02		-0.02		-0.08		-0.09
PAYMENT CHARACTERISTICS												
$\overline{RCHAR}_i$ Acceptance	0.09***	0.07*	0.09***	0.07**	0.02	0.05**	0.02	0.05**	-0.01	0.04	-0.01	0.03
$\overline{RCHAR}_i$ cost	0.06	0.22***	0.06	0.22***	0.12***	0.05***	0.12***	0.05***	-0.00	0.04*	-0.01	0.04
$\overline{RCHAR}_i$ convenience	0.09**	0.25***	0.10*	0.25***	0.20***	0.11***	0.20***	0.11***	-0.01	0.05	-0.01	0.05
$\overline{RCHAR}_{i_{security}}^{orthogonal}$	0.02	0.05*	0.02	0.05*	0.01	0.02	0.01	0.02	-0.01	-0.00	-0.01	-0.00
Constant	0.57***		0.57***		0.10		0.11		0.17		0.19	
H_o: $\beta_2 + \beta_3 = 0$			0.42	0.20			5.13**	2.24			1.12	3.67**
H_o: $\beta_2 + \beta_4 = 0$			0.35	0.97			9.83***	2.05			0.55	17.40***
H_o: $\beta_2 = \beta_3 = \beta_4$			0.26	0.59			4.91*	2.92			0.54	9.64***
Observations	1,848		1,848		1,846		1,846		1,824		1,824	
Wald Test (chi-squared)	146.1***		218.1***		509.2***		469.9***		544.5***		109.5***	
Inverse of Mill's ratio (λ_i^{-1})	-0.158*		-0.149		0.174***		0.165***		-0.077		-0.092	

Source: 2009 Survey of Consumer Payment Choice.

Notes: Table entries for adoption are the marginal effects estimates from the Probit regression in the first stage of the Heckman 2-step procedure. The dependent variable is set equal to 1 if the respondent has adopted the payment type. Otherwise, it equals zero. Table entries for usage are coefficient estimates from the second stage of the Heckman selection model. The dependent variable is the share of total payments made with that payment type. The Heckman 2-step procedure excludes respondents that have missing values in the second stage only if the dependent variable of the first stage is equal to 1, i.e. they had adopted the payment method. [$]The excluded variables for the financial categories above are as follows: Brokerage, Internet bank and others (payment provider) and $50,000–$74,999 (income). *, **, *** indicate that the estimates are statistically different from zero at 0.10, 0.05, and 0.01 probability levels.

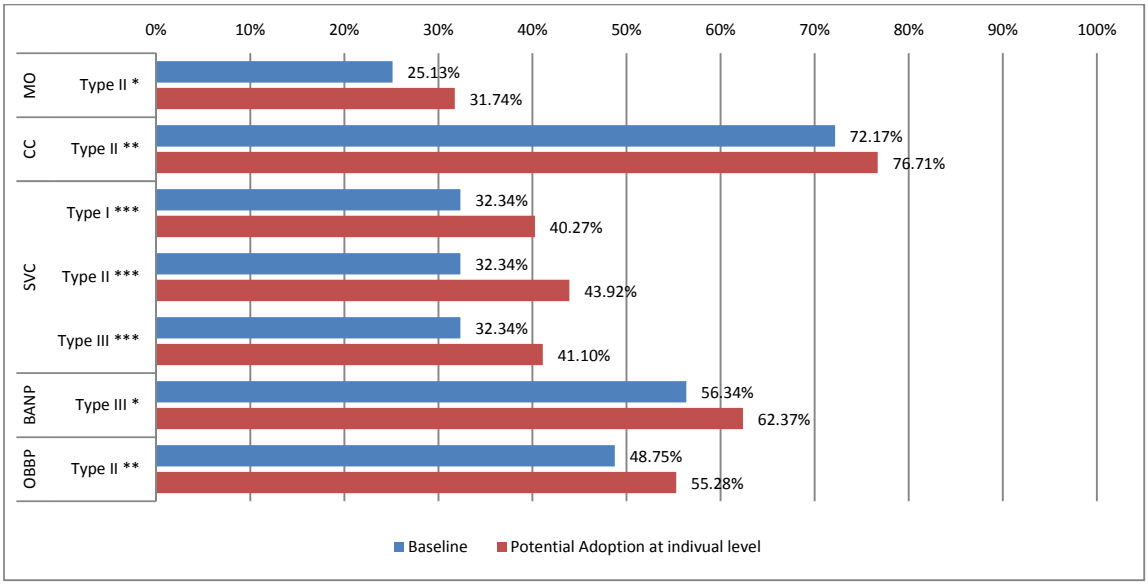
PANEL C. ELECTRONIC PAYMENT INSTRUMENTS

	BANK ACCOUNT NUMBER PAYMENTS				ONLINE BANKING BILL PAYMENT			
	Model 8		Model 8a		Model 9		Model 9a	
	Usage	Adoption	Usage	Adoption	Usage	Adoption	Usage	Adoption
SECURITY INDICATORS								
Type I (β_1)	-0.00	0.04			-0.02**	0.00		
Type II (β_2)			-0.00	0.03			-0.01	0.07**
Type III (β_3)			0.00	0.06*			-0.02*	-0.02
Type IV (β_4)			-0.00	-0.01			-0.03***	-0.00
SOCIO DEMOGRAPHICS								
Age	-0.00	0.00	-0.00	-0.00	0.00*	-0.01*	0.00*	-0.01**
Age^2	0.00	-0.00	0.00	-0.00	-0.00*	0.00	-0.00*	0.00
Sex (male=1)	-0.01	-0.03	-0.01*	-0.03*	-0.01	0.03	-0.01	0.03*
Education level	-0.00	0.03**	-0.00	0.03***	0.00	0.04***	0.00	0.03***
Marital Status (single=1)	0.01	-0.06*	0.01	-0.06*	-0.01	-0.05*	-0.01	-0.05*
Currently working (Yes=1)	0.02*	0.02	0.02**	0.02	-0.01	0.00	-0.01	0.00
FINANCIAL VARIABLES								
Income per year[$]								
Under $25,000	-0.02	-0.07	-0.02**	-0.06	-0.02	-0.09***	-0.02	-0.09**
$25,000 - $49,000	-0.01	0.02	-0.01	0.02	-0.01	-0.04	-0.01	-0.04
$75,000 - $99,999	-0.01	-0.01	-0.01	-0.01	-0.03**	0.02	-0.03**	0.02
Greater than $100,000	-0.01	0.05	-0.01	0.05*	-0.01	0.07***	-0.01	0.07***
Number of Payment instruments								
$\overline{NUM}_{ti}$	-0.00***		-0.00**		-0.01**		-0.01***	
Payment provider[$]								
Commercial Bank		0.05		0.05		-0.11*		-0.11*
Credit Union		0.07		0.07		-0.10		-0.10
PAYMENT CHARACTERISTICS								
$\overline{RCHAR}_i$ Acceptance	0.00	0.06***	0.01	0.06***	0.03***	0.02	0.03***	0.03
$\overline{RCHAR}_i$ cost	0.02	0.07	0.02	0.07	0.06*	0.27***	0.06**	0.27***
$\overline{RCHAR}_i$ convenience	0.04	0.13***	0.04**	0.13***	0.06	0.33***	0.05*	0.33***
$\overline{RCHAR}_{i_{security}}^{orthogonal}$	0.01	0.07***	0.01	0.07***	0.02	0.12***	0.02	0.12***
Constant	0.13*		0.12**		0.07		0.07	
H_o: $\beta_2 + \beta_3 = 0$			0.00	0.22			2.12	0.85
H_o: $\beta_2 + \beta_4 = 0$			0.02	0.07			3.87	1.04
H_o: $\beta_2 = \beta_3 = \beta_4$			0.05	2.75			2.19	6.14**
Observations	1,837		1,837		1,843		1,843	
Wald Test (chi-squared)	61.51***		63.44***		143.9***		120.9***	
Inverse of Mill's ratio (λ_i^{-1})	0.053		0.079		0.007		0.007	

Source: 2009 Survey of Consumer Payment Choice.

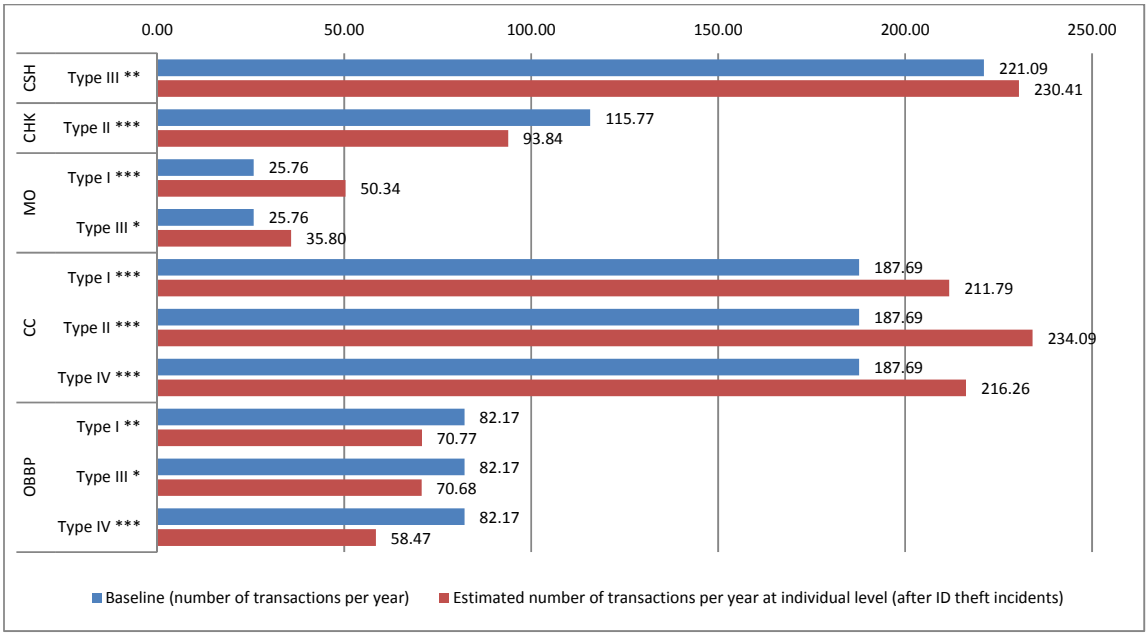
Notes: Table entries for adoption are the marginal effects estimates from the Probit regression in the first stage of the Heckman 2-step procedure. The dependent variable is set equal to 1 if the respondent has adopted the payment type. Otherwise, it equals zero. Table entries for usage are coefficient estimates from the second stage of the Heckman selection model. The dependent variable is the share of total payments made with that payment type. The Heckman 2-step procedure excludes respondents that have missing values in the second stage only if the dependent variable of the first stage is equal to 1, i.e. they had adopted the payment method. [$]The excluded variables for the financial categories above are as follows: Brokerage, Internet bank and others (payment provider) and $50,000–$74,999 (income). *, **, *** indicate that the estimates are statistically different from zero at 0.10, 0.05, and 0.01 probability levels.

Figure 4. Simulated effects of identity theft incidents on the probability to adopt payment instruments



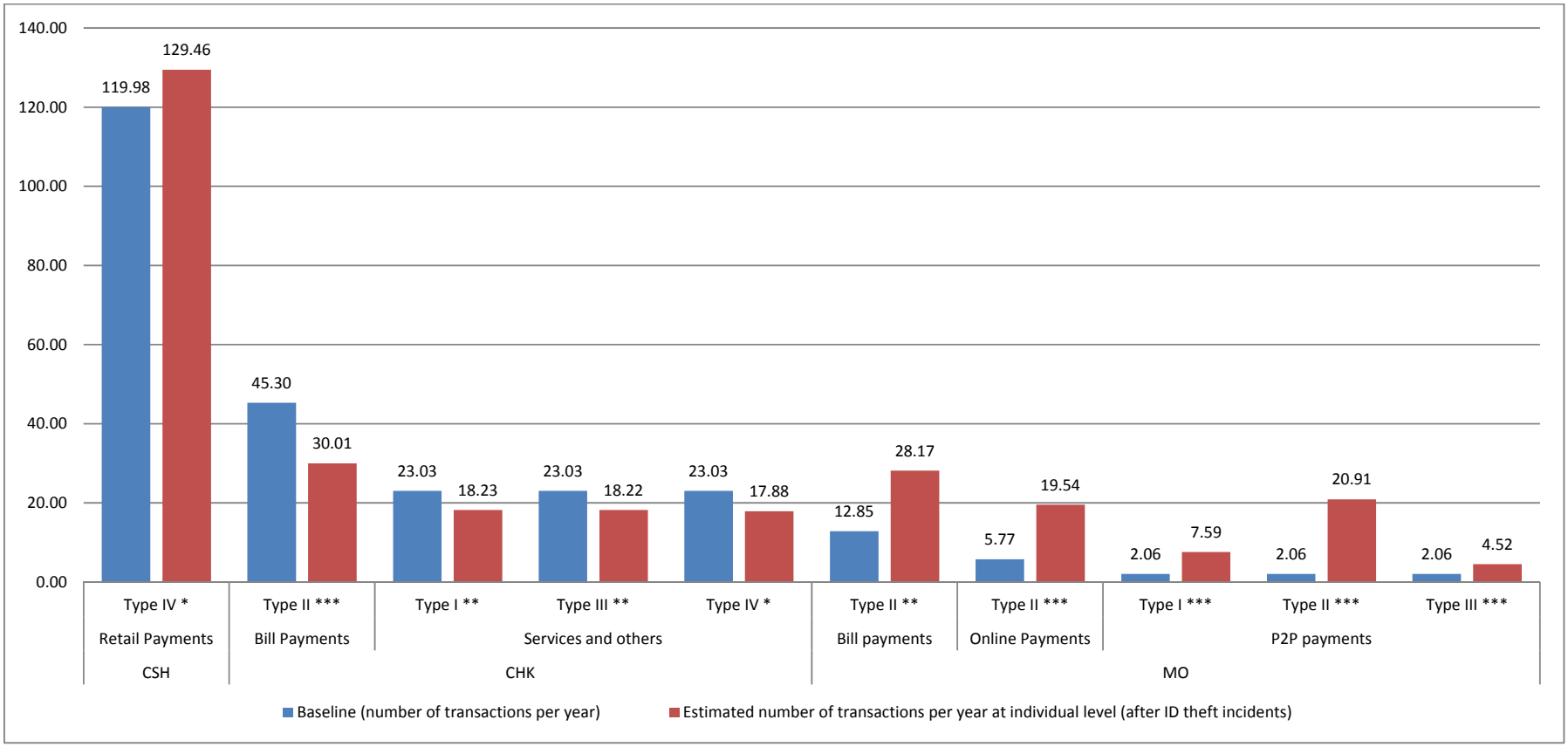
Notes: Payment instruments are classified as follows: four types of paper based instruments—cash (CS), checks (CK), money orders (MO), and traveler checks (TC); three types of payment cards—debit (DC), credit (CC), and stored value cards (SVC); and two types of electronic payment instruments—online banking bill payment (OBBP) and bank account number payments (BANP).Standard errors are included in parenthesis. *, **, *** indicate that the estimates are statistically different from zero at 0.10, 0.05, and 0.01 probability levels.

Figure 5. Simulated effects of identity theft incidents on the usage (number of transactions per year) of payment instruments



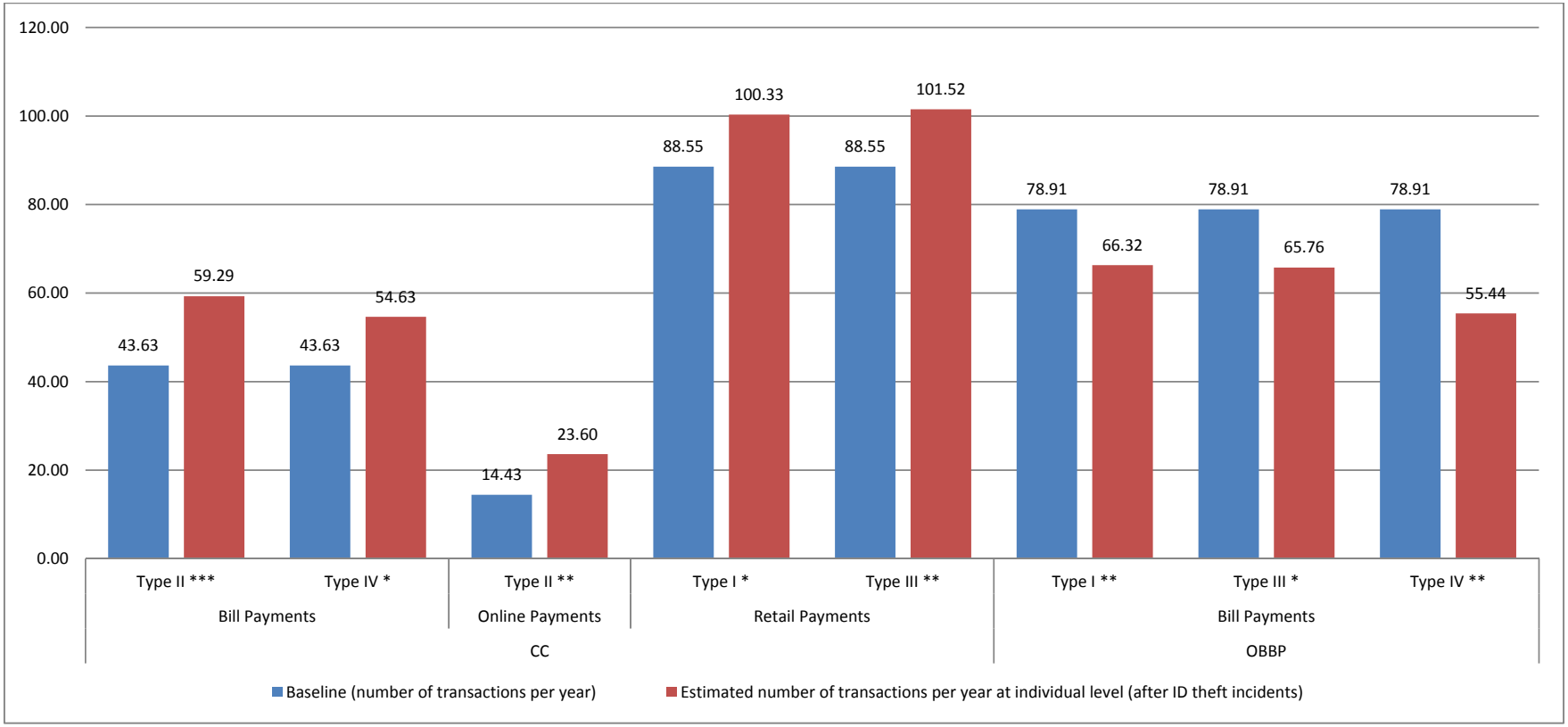
Notes: Payment instruments are classified as follows: four types of paper based instruments—cash (CS), checks (CK), money orders (MO), and traveler checks (TC); three types of payment cards—debit (DC), credit (CC), and stored value cards (SVC); and two types of electronic payment instruments—online banking bill payment (OBBP) and bank account number payments (BANP).Standard errors are included in parenthesis. *, **, *** indicate that the estimates are statistically different from zero at 0.10, 0.05, and 0.01 probability levels.

Figure 6a. Simulated effect of identity theft incidents on the usage (number of transactions per year) of payment instruments (by type of transaction)



Notes: Payment instruments are classified as follows: four types of paper based instruments—cash (CS), checks (CK), money orders (MO), and traveler checks (TC); three types of payment cards—debit (DC), credit (CC), and stored value cards (SVC); and two types of electronic payment instruments—online banking bill payment (OBBP) and bank account number payments (BANP).Standard errors are included in parenthesis. *, **, *** indicate that the estimates are statistically different from zero at 0.10, 0.05, and 0.01 probability levels.

Figure 6b. Simulated effect of identity theft incidents on the usage (number of transactions per year) of payment instruments (by type of transaction)



Notes: Payment instruments are classified as follows: four types of paper based instruments—cash (CS), checks (CK), money orders (MO), and traveler checks (TC); three types of payment cards—debit (DC), credit (CC), and stored value cards (SVC); and two types of electronic payment instruments—online banking bill payment (OBBP) and bank account number payments (BANP).Standard errors are included in parenthesis. *, **, *** indicate that the estimates are statistically different from zero at 0.10, 0.05, and 0.01 probability levels.

Appendix A. Definitions of payment instruments and adoption

Payment Instrument	Definition of payment instrument	Definition of adoption
Cash (CSH)	Coins and paper bills.	The consumer has used cash to make a payment at least once in the past 12 months, holds cash (on person or on property), gets cash on a regular basis, or uses cash in a typical year.
Check (CHK)	A written order directing a financial institution to pay a specific amount of money to a person or business.	The consumer has used a check in the past 12 months.
Money order (MO)	A written order that can be purchased from a bank or other institution and allows the individual named on the order to receive a specified amount of cash on demand.	The consumer has used a money order in the past 12 months.
Travelers Check (TC)	A written order, similar to a check that is signed by the buyer both when purchased and again in the payee's presence at the time of cashing. A traveler's check is protected against loss or theft. Traveler's checks are purchased in advance and issued for a specific amount of money.	The consumer has used a traveler check in the past 12 months.
Debit Card (DC)	A card that allows the cardholder to make a purchase that will be paid back to the credit card company later.	The consumer has a bank account and a debit card.
Credit Card (CC)	Also called a check card. A card that allows the cardholder to make purchases or payments in addition to allowing access to the cardholder's bank accounts through an ATM.	The consumer has a credit card.
Stored Value Card (SVC)	A card that has money stored or loaded onto it. Also known as a stored-value card or gift card.	The consumer has a prepaid card of any type (general purpose, specific purpose, payroll, or electronic benefits transfer (EBT)).
Bank account number payment (BANP)	A payment made by providing one's bank account number to a third party, such as an employer or a utility company. The number can be provided on websites, paper forms, etc. One does not have to visit the bank's website to make these payments.	The consumer makes an electronic bank account number payment in a typical year.
Online banking bill payment (OBBP)	An electronic payment made directly from a bank's online banking website. This payment does not require the customer or the bank to disclose the customer's bank account number to a third party.	The consumer has a bank account, has set up online banking, and has set up access to the online bill payment function.

Appendix B. Definitions of transaction types

Concept	Definition
Bill payment	A payment made to a company or person at a date after the time when the company or person provided goods or services to a consumer. Examples include a payment to a utility company for energy services provided during a month or a payment to service a loan, such as a mortgage. Most bill payments occur at regular frequencies such as weekly, monthly, or yearly.
Online payment (OP)	A payment (other than payment of a bill) made for an online transaction or transfer of funds. The purchase or transfer is initiated either via the website of a seller of goods and services or other institution, or via a payment intermediary, such as PayPal. Consumers make an OP at their discretion and as needed. Included in this concept are payments made via check or money order (sent by mail) as well as payments made via debit or credit card or via bank account number payment (BANP), if the payment is made in connection with a transaction initiated online.
Retail payment	A payment made while shopping in person to buy basic goods from retail outlets, including food and grocery stores, restaurants; superstores, warehouses, and club stores; drug or convenience stores; gas stations; department stores; electronics, hardware and appliance stores; home goods and furniture stores.
Services and other payments	A payment made in person by a consumer for services such as transportation and tolls; medical, dental, health and fitness; education and child care; personal care (for example, hair care); recreation, entertainment, and travel; maintenance and repairs; other professional services (business, legal, etc.); charitable donations.
Person-to-person payments	Transfers or transactions made between two private individuals. Examples include payments for babysitting or allowances, paying a person for something that is not business related, and account-to-account payments from one person's bank account to another person's bank account.

Appendix III. The impact of Security and Identity Theft on Usage of payment instruments (by type of transaction)

PANEL D. PAPER BASED INSTRUMENTS

		Bill Payments		Online Payments		Retail Payments		Services and others		P2P payments	
PAYMENT INSTRUMENT	**SECURITY INDICATORS**	**Model 1**	**Model 1a**	**Model 2**	**Model 2a**	**Model 3**	**Model 3a**	**Model 3**	**Model 3a**	**Model 4**	**Model 4a**
Cash	Type I (β_1)	-0.00				0.00		0.00		0.00	
	Type II (β_2)		0.01				-0.00		0.00		0.00
	Type III (β_3)		-0.00				0.01		0.00		0.00
	Type IV (β_4)		0.01				0.01		0.00		0.00
	H_o: $\beta_2 + \beta_3 = 0$		6.66***				0.14		1.00		0.30
	H_o: $\beta_2 + \beta_4 = 0$		0.27				1.02		0.53		0.48
	H_o: $\beta_2 = \beta_3 = \beta_4$		8.31**				2.22		0.04		1.03
	Observations	1,713	1,713			1,807	1,807	1,780	1,780	1,802	1,802
	Wald Test (chi-squared)	117.1***	126.7***			255.5***	478.7***	425.4***	416.5***	489.6***	563.8***
	Inverse of Mill's ratio	-5636	3144			218854	254309***	-112007**	-117407	-27622	-90065***
Check	Type I (β_1)	-0.00		-0.00		-0.00		-0.01**		-0.00	
	Type II (β_2)		-0.02***		0.00		-0.00		-0.01		-0.00
	Type III (β_3)		0.00		-0.00		0.00		-0.01**		-0.00
	Type IV (β_4)		0.00		0.00		-0.00		-0.01*		-0.00
	H_o: $\beta_2 + \beta_3 = 0$		4.17**		0.14		0.21		5.22***		0.27
	H_o: $\beta_2 + \beta_4 = 0$		4.45**		0.14		0.73		7.26***		0.38
	H_o: $\beta_2 = \beta_3 = \beta_4$		18.80***		1.02		0.60		0.02		0.06
	Observations	1,838	1,838	1,784	1,784	1,789	1,789	1,799	1,799	1,801	1,801
	Wald Test (chi-squared)	452.1***	520.6***	91.68***	149.2***	171.0***	263.0***	275.8***	353.6***	56.52***	55.08***
	Inverse of Mill's ratio	-0.0975*	-0.0965*	0.0336	0.0282	0.0221	0.0217	0.0112	0.00961	0.00176	0.000825
Money Order	Type I (β_1)	0.01		0.01		0.00		0.00		0.01***	
	Type II (β_2)		0.04**		0.05***		0.00		0.01		0.03***
	Type III (β_3)		0.00		0.00		0.00		0.00		0.0004**
	Type IV (β_4)		0.00		-0.01		-0.00		0.00		0.00
	H_o: $\beta_2 + \beta_3 = 0$		1.68		7.23***		0.15		0.55		7.91***
	H_o: $\beta_2 + \beta_4 = 0$		1.55		2.86*		0.00		0.63		11.22***
	H_o: $\beta_2 = \beta_3 = \beta_4$		2.11*		25.61***		0.52		0.61		31.15***
	Observations	1,861	1,861	1,866	1,866	1,861	1,861	1,861	1,861	1,866	1,866
	Wald Test (chi-squared)	18.73*	50.83***	36.00***	57.71***	22.20**	11.94	7.183	9.473	101.7***	116.13***
	Inverse of Mill's ratio	0.0873	0.164***	0.117***	0.192***	0.00527*	0.0108	-0.000363	0.0208	0.120***	0.146***

PANEL E. PAYMENT CARD INSTRUMENTS

PAYMENT INSTRUMENT	SECURITY INDICATORS	Bill Payments		Online Payments		Retail Payments		Services and Others		P2P payments	
		Model 1	Model 1a	Model 2	Model 2a	Model 3	Model 3a	Model 3	Model 3a	Model 4	Model 4a
Debit Card	Type I (β_1)	-0.00		-0.00		-0.00		-0.00		-0.00	
	Type II (β_2)		-0.00		-0.00		-0.02		-0.00		-0.00
	Type III (β_3)		-0.01		-0.00		0.00		-0.00		-0.00
	Type IV (β_4)		-0.00		-0.00		-0.00		0.01		0.00
	H_o: $\beta_2 + \beta_3 = 0$		0.64		0.18		0.68		0.06		0.56
	H_o: $\beta_2 + \beta_4 = 0$		0.00		0.06		1.15		0.11		0.15
	H_o: $\beta_2 = \beta_3 = \beta_4$		0.58		0.01		1.30		0.87		0.63
	Observations	1,806	1,806	1,803	1,803	1,826	1,826	1,804	1,804	1,774	1,774
	Wald Test (chi-squared)	88.35***	108.9***	43.91***	53.68***	106.6***	86.97***	79.35***	186.4***	62.10***	39.47***
	Inverse of Mill's ratio	-0.0361	-0.0297	-0.0121	-0.0116	-0.0942	-0.0916	-0.0385	-0.0402	0.0126	0.0127
Credit Card	Type I (β_1)	0.01		0.00		0.01*		0.00		0.00	
	Type II (β_2)		0.02***		0.01**		0.01		0.01		0.00
	Type III (β_3)		-0.00		-0.00		0.02**		0.00		-0.00
	Type IV (β_4)		0.01*		0.00		0.02		0.00		0.00
	H_o: $\beta_2 + \beta_3 = 0$		2.24		2.08		2.08		1.45		0.32
	H_o: $\beta_2 + \beta_4 = 0$		6.32***		4.60**		1.86		0.84		0.83
	H_o: $\beta_2 = \beta_3 = \beta_4$		11.41***		10.11***		0.37		0.73		3.36
	Observations	1,811	1,811	1,812	1,812	1,818	1,818	1,808	1,808	1,781	1,781
	Wald Test (chi-squared)	103.0***	172.6***	56.87***	38.29***	316.5***	501.2***	168.5***	212.3***	78.31***	74.62***
	Inverse of Mill's ratio	0.0356	0.0354*	-0.0110	-0.0107	0.115***	0.111***	0.0213	0.0152	0.00383	0.00323
Store Value Card	Type I (β_1)	-0.01		-0.01		0.01		0.00			
	Type II (β_2)		-0.01		-0.01		0.01		0.01		
	Type III (β_3)		-0.01		-0.01		0.01		0.00		
	Type IV (β_4)		0.00		0.00		-0.01		-0.00		
	H_o: $\beta_2 + \beta_3 = 0$		0.48		0.64		0.40		1.29		
	H_o: $\beta_2 + \beta_4 = 0$		0.42		0.62		0.00		0.68		
	H_o: $\beta_2 = \beta_3 = \beta_4$		0.83		0.90		1.33		3.65		
	Observations	1,795	1,795	1,809	1,809	1,810	1,810	1,812	1,812		
	Wald Test (chi-squared)	6.621	9.496	13.26	14.23	10.29	6.68	10.77	14.16		
	Inverse of Mill's ratio	-0.0443	-0.0464	-0.0565	-0.0567	0.0628	0.0380	0.0393	0.0354		

PANEL F. ELECTRONIC PAYMENT INSTRUMENTS

PAYMENT INSTRUMENT	SECURITY INDICATORS	Bill Payments		Online Payments		P2P payments	
		Model 1	Model 1a	Model 2	Model 2a	Model 4	Model 4a
Bank account number payments	Type I (β_1)	-0.00		0.00		-0.00	
	Type II (β_2)		0.00		-0.00		-0.00
	Type III (β_3)		-0.00		0.00		-0.00
	Type IV (β_4)		-0.01		0.00		-0.00
	H_o: $\beta_2 + \beta_3 = 0$		0.00		0.00		0.17
	H_o: $\beta_2 + \beta_4 = 0$		0.04		0.00		0.63
	H_o: $\beta_2 = \beta_3 = \beta_4$		0.10		0.90		0.32
	Observations	1,833	1,833	1,792	1,792	1,769	1,769
	Wald Test (chi-squared)	40.42***	41.20***	109.8***	67.80***	54.55***	34.76***
	Inverse of Mill's ratio	0.0644	0.0821	-0.0187	-0.00798	0.00115	-0.00136
Online banking bill payment	Type I (β_1)	-0.02**				0.00	
	Type II (β_2)		-0.01				0.00
	Type III (β_3)		-0.02*				0.00
	Type IV (β_4)		-0.03**				0.00
	H_o: $\beta_2 + \beta_3 = 0$		1.75				3.14**
	H_o: $\beta_2 + \beta_4 = 0$		3.57**				1.21
	H_o: $\beta_2 = \beta_3 = \beta_4$		1.85*				0.63
	Observations	1,829	1,829			1,793	1,793
	Wald Test (chi-squared)	96.42***	85.26***			32.23***	39.37***
	Inverse of Mill's ratio	0.00454	-0.000983			0.00473	0.00995

Note: Panel A, B and C includes second-step estimations of the Heckman Model (where first step regressions correspond to adoption decisions, which are the same as those reported in Table 5).