EFFECTS OF PERSONALITY TRAITS ON PAYMENT BEHAVIOR: EVIDENCE FROM THE UNITED STATES

by

ADITI ROUTH

(Under the Direction of Sophia T. Anong)

ABSTRACT

This study investigates the influence of personality traits on payment method adoption and use. Mainly, this study focuses on consumers holding a bundle of payment methods at a particular time and using one from this "portfolio" for a transaction. This study begins with an exploratory trend analysis of the payment portfolios held by consumers using panel data for 2015-2020 of the Survey of Consumer Payment Choice (SCPC). The first ten portfolios cover about 70% of the sample population. The most popular payment portfolio includes cash, checks, money orders, debit cards, credit cards, and ACH transfers made online using bank account number. Mobile payments appear only in the third and fourth most popular portfolios, increasingly adopted in recent years. The portfolio comprising all payment methods, including cash, checks, money orders, debit cards, credit cards, prepaid cards, ACH transfers, and mobile payments, showed a significant jump in its adoption rate in 2020. A portfolio including only cash is the tenth most popular portfolio, and its adoption has also been rising.

Next, a survey from the Understanding America Survey (UAS) panel is linked to the SCPC to examine the influence of personality traits on payment behavior. Multinomial logit

analyses are used for this purpose. Although the effects are small in magnitude, traits like Extroversion, Openness to Experience, Conscientiousness, and Neuroticism significantly influence payment behavior. Extroversion and Openness to Experience are positively associated with adopting portfolios that include mobile payments at the adoption stage. At the use stage, Conscientiousness increases the likelihood of using checks and money orders for in-person transactions and using ACH transfers for online transactions. Neuroticism is positively associated with using credit cards, checks, and money orders for in-person transactions. Openness to Experience positively influences the likelihood of using all types of cards, checks, and money orders but negatively influences the use of ACH transfers for online transactions. Like previous researchers, this study finds that demographic characteristics largely govern payment behavior followed by payment method attributes, e.g., cost, convenience, and security. Further, in-depth knowledge about personality traits associated with payment behavior has important implications for the payments industry, policymakers, and financial advisors.

INDEX WORDS: Payment behavior, Payment methods, Adoption, Use, FinTech innovation, Big Five personality traits

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DEDICATION

I would like to dedicate this dissertation to all Educators, especially my Teachers and Professors whose continued support and encouragement along the way have meant more to me than they will ever know.

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CHAPTER 1

INTRODUCTION

The introduction of Europay, MasterCard®, and Visa® (EMV) cards, contactless payments via mobile apps or wallets, peer-to-peer transfers using apps like Venmo, and portable point of sale (POS) readers has changed the global payment landscape entirely (Charpentier, 2021; Rysman & Schuh, 2017). Researchers agree that the rapid acceptance and use of these developments have occurred much more slowly in the U.S. than in several developed and developing countries. Consequently, researchers have continuously examined whether consumers are willing to adopt the newest technological advancements in the payments sector and the factors responsible for adopting new payment methods while using existing methods. Differences in consumer demographic characteristics, attributes specific to payment methods, the types of transactions, and current policies and regulations are known to predict the payment behavior of consumers (Ke et al., 2018; Stavins, 2017).

The ongoing COVID-19 pandemic has accelerated the payments industry revolution by two to three years (Toplin, 2021). There has been a radical shift away from cash toward digital payments, with e-commerce and m-commerce emerging as the primary purchasing channels, focusing on delivering highly personalized end-to-end transaction experiences by payment services providers (Kriegel, 2021). Further, Baik et al. (2016) assert that formulating a user or consumer profile is one of the essential factors for developing a personalized recommendation regarding a service. The rich body of literature examines several factors determining payment behavior at an individual level, such as demographic characteristics and perceptions regarding

payment methods, but it does not explore the influence of personality traits on payment behavior. Consumer behavior research recognizes personality traits as one of the significant internal influencers on purchase behavior in addition to demographic characteristics, lifestyle, motivation, attitudes, and beliefs (Sandhusen, 2000). This study aims to understand the role of personality traits in explaining consumers' payment behavior. Specifically, it asks two questions, first, how do personality traits affect the adoption of a bundle of payment methods, that is, payment portfolios, and second, how do personality traits affect the use of specific payment methods. Having a clear understanding of consumers' payment behavior becomes imperative as it governs marketing campaigns, helps decision-making by payment services companies, and informs payment policy interventions. The following sections provide a preview of the current payment trends in the United States as a primer for building up this study on payment behavior.

Overview of Payment Trends in the United States

In the United States, consumers have migrated from using paper instruments, namely cash and checks, to electronic payment methods such as swiping debit and credit cards to conducting transactions using mobile phones, apps, or wallets (Holst et al., 2015; Stavins, 2017; Wang & Wolman, 2016). Although today consumers can choose from a greater variety of payment methods than a decade ago, cash, debit cards, and credit cards continue to be the most popular methods used for transactions (Connolly & Stavins, 2015; Foster et al., 2019, 2020, 2021; Greene et al., 2017; Greene & Stavins, 2018). Additionally, cryptocurrencies have gained traction in the U.S. and were recently made legal (Foster et al., 2019, 2020, 2021; Greene et al., 2017; Greene & Stavins, 2018). De Best (2021) stresses that cryptocurrencies are constrained by the lack of comprehensive regulations and lengthy transaction times, hindering them from becoming more popular.

The COVID-19 pandemic acted as a catalyst in the significant adoption of contactless payment systems and switching to online payments in the U.S. (Coyle et al., 2021; Harrison, 2021). The pandemic accelerated emerging payments trends, with both the merchant and customer sides picking up the pace to evolve with changing market conditions. This will potentially create more opportunities for disruption in the payments ecosystem in the near future. Payment experts claim that the current payment behavior is different from the pre-pandemic payment behavior (Visa, 2020). However, the question remains as to how permanent these changes will be. Payment instrument usage by U.S. consumers is discussed in greater detail in Chapter 2.

Overview of Determinants of Payment Behavior

Among the supply-side factors that determine the use and adoption of payment methods, cost, especially differences in costs across various payment methods, is a significant factor (Koulayev et al., 2016; Schuh & Stavins, 2010; Schuh & Stavins, 2011; Stavins & Wu, 2017). In addition, available technology, merchant acceptance of payment methods, and current policies and regulations are other supply-side factors influencing payment choice (Stavins, 2017).

The influence of demand-side factors in determining the adoption and usage of payment methods has been extensively studied. These include socio-economic characteristics; consumer assessments of payment method attributes, such as assessments regarding cost, convenience, acceptance, and security linked to payment methods; and other consumer preferences (Bertaut & Haliassos, 2006; Connolly & Stavins, 2015; Hirschman, 1982; Hogarth et al., 2004; Kim et al., 2006; Klee, 2006; Koulayev et al., 2016; Mester, 2012; Rysman, 2010; Schreft, 2006; Schuh & Stavins, 2010, 2013, 2016; Schuh & Stavins, 2011; Stavins, 2002, 2017; Zinman, 2009).

However, limited research examines the role of individual personality in determining payment choices in the U.S.

Statement of the Problem

Specific gaps have been noted in the prior literature on payment behavior. First, while there has been some research on consumers' personality traits associated with their payment behavior, more is needed. Due to evolving technological innovations in the payment landscape, most previous research has used various technology acceptance models to study the determinants of adopting an electronic payment method, such as mobile payments (Al-Jabri & Sohail, 2012; Almazroa & Gulliver, 2018; Khan et al., 2019; Liu et al., 2019; Świecka et al., 2021), thus, limiting payment-related research to only one kind of payment method. Second, the Big Five personality traits (Goldberg, 1990; McCrae & Costa, 2003) have been linked to several financial traits such as risk tolerance (Kubilay & Bayrakdaroglu, 2016), investment biases (Nga & Yien, 2013), and financial behaviors such as socially responsible investing (Nga & Yien, 2013), stock trading behavior (Tauni et al., 2017), compulsive buying (Brougham et al., 2011; Mowen & Spears, 1999), impulsive buying (Bratko et al., 2013; Shahjehan et al., 2012), and debt management (Mutlu & Özer, 2021). Many of these financial behaviors potentially involve using payment methods, yet payment behavior associated with personality traits has been studied but not extensively. Third, the personalization of digital payment services is a major factor driving customer preferences in addition to factors such as the significant digitization in the payments industry, efficient and highly convenient transaction experiences (Global Payments, 2022). This calls for a deeper understanding of the influence of consumers' personality traits on their payment behavior. Incorporating consumers' personality traits to predict payment behavior will be essential to advance research in this area.

Aside from personality traits, another significant gap in the payment literature was noticed. Consumers hold many payment methods at a particular time and use one from their payment "portfolio" for a transaction (Connolly & Stavins, 2015; Hogarth et al., 2008; Schreft, 2006). Most previous research on payments has narrowly studied a particular payment method. There has been very little research considering the portfolios of different payment methods that consumers hold except for recent studies by Koulayev et al. (2016) and Trütsch (2016). Further, Schreft (2006) asserts that the decision-making process involved in payment choice is quite complex and that additional research, especially interdisciplinary research, is needed. Addressing these gaps in previous literature about payment behavior, this study aims to understand the role of personality traits in determining consumer payment behavior.

Approach to the Problem

Payment behavior, in this study, is defined as the choices that consumers make in two stages: first, adopting a portfolio of payment methods (extensive margin), and second, using a payment method from the portfolio to make a payment for a transaction (intensive margin). The concept of extensive margin representing adoption of payment methods and intensive margin indicating the use of payment methods has been used in payment behavior context previously by Schuh and Stavins (2010), Zinman (2009), and Stavins (2016).

To this end, this study uses panel data from 2015 to 2020 annual rounds of the Survey of Consumer Payment Choice (SCPC). First, an exploratory trend analysis examines the U.S. consumers' payment behavior over time. Following this, the SCPC is merged with "UAS1: Financial Literacy; Personality; Understanding Probabilities; Numeracy" from the Understanding America Study (UAS) panel containing information on personality traits. This survey measures personality traits using data on the Big Five personality traits. Discrete-choice econometric

models are applied to estimate the role of personality traits in adopting payment portfolios and usage of payment methods. In addition, information on consumers' demographic characteristics, assessment of attributes of payment methods, and other financial traits and behaviors are controlled for in the econometric analysis.

Significance of the Study

Examining payment methods as well as payment portfolios in association with consumers' personality traits is essential for designing payment services centered around its end-users with numerous personas. It may also help payment service providers to target a specific consumer base with relevant advertisements. Conversely, predatory payment service providers may advertise emphasizing certain personality traits nudging consumers to use a particular predatory service, calling for the attention of policymakers and a need for policy interventions in the payment industry. Having a clear understanding of consumers' payment behavior becomes imperative as it governs marketing campaigns, helps decision-making by payment services companies, and informs payment policy interventions.

Moreover, money disorders such as compulsive and impulsive buying have been associated with consumers' personality traits (Bratko et al., 2013; Shahjehan et al., 2012). With the results from this study, financial advisors, planners, or therapists can link these money disorders of their clients to their payment behavior using the knowledge of their personality traits. This may help discourage their clients from using specific payment methods. Thus, the results from this study will be of particular interest to financial service providers, consumer advocates, financial advisors, and policymakers. Implications are discussed at length later in the study.

Additionally, exploring consumer payment choices over time is interesting for several reasons. First, while adults' personality traits may not be subject to significant change over time, technological innovations in the payment landscape have transformed exponentially, making panel data analysis particularly interesting. Second, mobile payment adoption has been slow in the U.S. compared to other peer countries, such as Canada, Australia, and China, despite the rise in ownership of mobile phones (Rooney, 2019). Perhaps consumers' habits of using mobile payments have not formed yet. Merchants not accepting mobile payments, inconsistent systems at the point of sale, and security concerns limit consumers from using mobile payments (van Hoek, 2017). The situation, however, changed during the COVID-19 pandemic. Therefore, an investigation using panel data explores the adoption and use of payment methods over time.

Organization of the Dissertation

The remainder of the dissertation is organized as follows. Chapter 2 starts with an overview of the payment ecosystem introducing the key players in the system, existing payment methods used by consumers, and the current payment trends in the United States. Next, prior literature on payment behavior is discussed. An overview of the discipline of personality psychology, relevant theories, and conceptualization of the Five-Factor Model of personality traits and related definitions are discussed. Finally, a conceptual model is developed, and the hypotheses to be tested are mentioned. Chapter 3 describes the data used and how the payment portfolios are formulated. Next, econometric models estimating the influence of personality on payment portfolio adoption and payment method use are built. Chapter 4 reports the exploratory trend analysis of the payment portfolios held across 2015-2020. Following this, results from the econometric analyses are presented and discussed. Conclusions, limitations, and implications are presented in Chapter 5.

CHAPTER 2

Literature Review

This study focuses on understanding how personality traits influence payment behavior. This chapter begins with an overview of the payment ecosystem, its key players, the existing payment methods used by consumers, and the recent payment trends in the United States. Prior research on the adoption and usage of payment methods is discussed. An overview of the discipline of personality psychology, relevant theories, and conceptualization of the Five-Factor Model of personality traits are discussed. This is followed by a section describing how the Five-Factor Model of personality traits fits in this study and how it is applied. The final section discusses the research questions to be asked and the hypotheses to be tested in the study.

The Payment Ecosystem

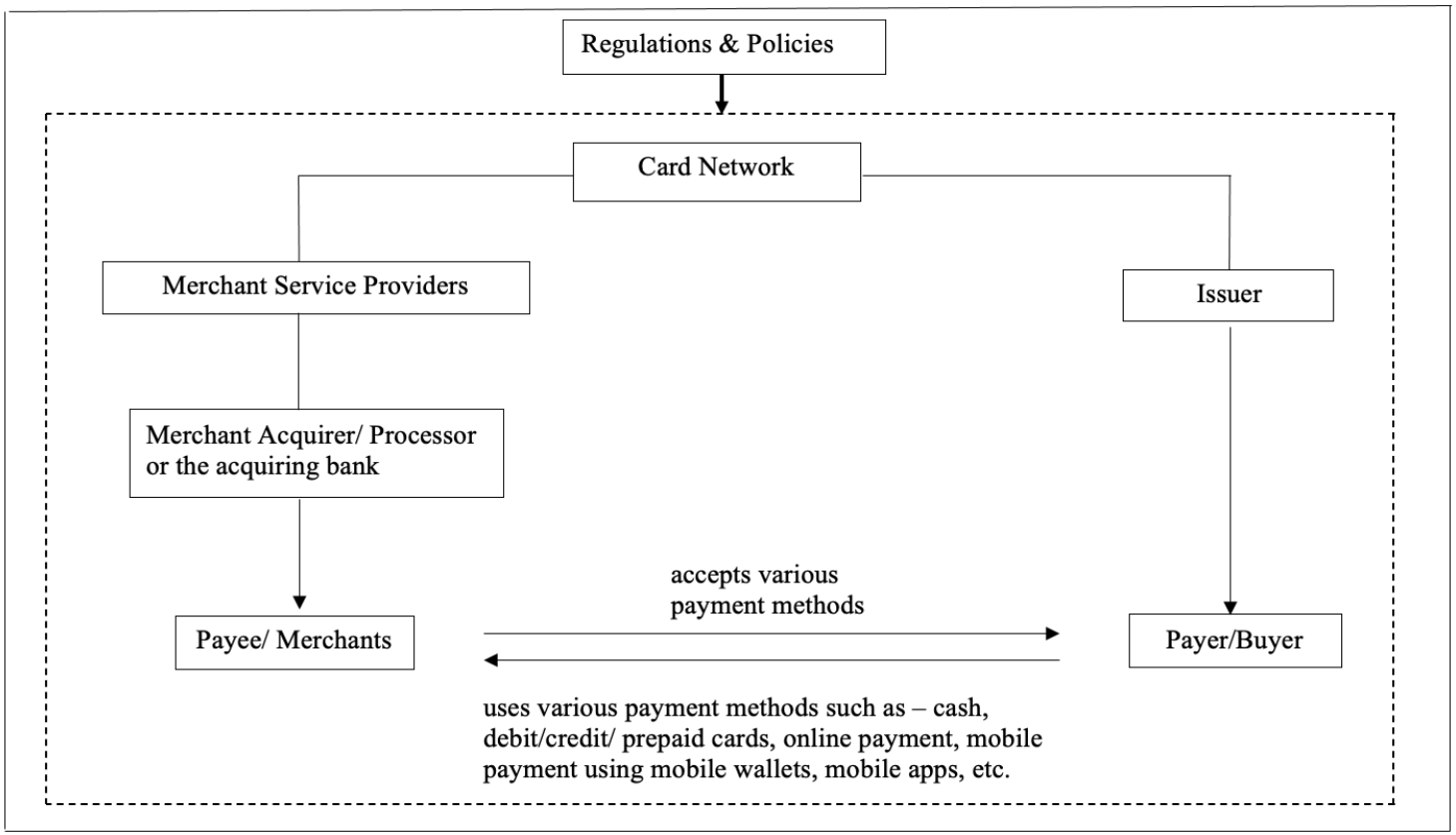
Payments are the transactions through which funds move from the payer to the payee (Dahlberg & Oorni, 2007). A payment system refers to "the complete set of instruments, intermediaries, rules, procedures, and processes and interbank funds transfer systems which facilitate the circulation of money in a country or currency area" (Kokkola, 2011, p. 25).

Key Players in the Payment System

Figure 1 shows the diagrammatic representation of the payment ecosystem and the various entities involved. The descriptions that follow will help the reader better understand the different payment methods mentioned in this study, and the key players involved, and provide an overview of the payment process (Dahlberg & Oorni, 2007; Smullian, 2021; Veljan, 2020).

Figure 1

Flowchart Representing the Payment Ecosystem and its Key Players



Note. Adapted from "Tech Trends in the Payment Ecosystem," by N. Smullian, 2021, *DataArt*. Copyright 2021 by DataArt; "The influence of intra- and inter-system concentration on the pre-regulated setting of interchange fees within cooperative card payment networks" by A. Veljan, 2020, *Journal of Banking Regulation, 21,* p. 139-151 (https://doi.org/10.1057/s41261-019-00103-2). Copyright 2020 by Springer Nature Limited.

- *The Payer/ Buyer:* The payer/buyer is the entity that holds various payment methods and uses them to buy goods and services.
- *The Issuer:* The issuer is the bank or a financial organization that provides consumers with the payment instrument and is liable for the consumer's usage and acquisition.
- *The Payee/ Merchant*: The payee/merchant is the seller of goods and services who accepts various payment methods to receive the price of goods and services sold.
- *The Merchant Acquirer*: The processor or the acquiring bank is a financial entity that enables a merchant to accept payments from a customer's card-issuing bank within a card network.
- *Merchant Service Providers (MSP)*: MSPs are organizations affiliated with banks and certified with card networks that provide the infrastructure that links merchants and customers to the payment networks. Additionally, they can also offer an online payment gateway and POS devices. MSPs could be third parties like Square, Stripe, Paypal, and Stax, or they may be operated by banks, such as Bank of America, Wells Fargo, and Chase, who offer their own tools, services, and fees.
- *The Card Network*: Card networks connect and switch transactions between merchant acquirers and issuers, enabling payment authorization. They are also responsible for clearing and settlement of the transactions. Card networks provide the technological infrastructure to connect all the stakeholders in the payment ecosystem.
- *Regulations*: Laws, regulations, and legislation drive innovations within the payment ecosystem. They aim to reduce risks, standardize best practices, have healthy competition, and encourage transparency in the payment sector (Omarini, 2018). For example, the 2010 Dodd-Frank Wall Street Reform and Consumer Protection Act is a well-known payment

regulation permitting card networks to allow merchants to provide discounts based on the payment method used, often resulting in price discrimination by merchants (Stavins, 2017).

Another example of payment-related regulation is the bill called the Payment Choice Act, introduced in Congress in 2019, making it unlawful for retailers to refuse to accept cash or charge a higher price to a customer who pays using cash. More recently, several retailers encouraged contactless payments instead of cash as public concerns grew about handling cash to curb the spread of COVID-19. However, the U.S. states of Massachusetts, New Jersey, Rhode Island, and Connecticut and cities like San Francisco, Philadelphia, and New York already have policies prohibiting businesses from refusing cash during transactions (Sadeghi, 2020). Alternatively, to tackle the public concern about the spread of Coronavirus, another bill called the Touchless Transaction Act of 2020, introduced in Congress, prohibits an issuer of an electronic fund transfer from requiring an individual's signature for a point-of-sale transfer that is initiated by a swipe or tap transaction.

Payment Methods and Payment Portfolios

Speaking particularly about payment methods, consumers in the United States commonly report adoption of cash, check, credit card, debit card, money order, prepaid card, traveler's check, Bank Account Number Payment (BANP), Online Banking Bill Payment (OBBP), and deduction from income (Foster et al., 2019, 2020, 2021; Greene et al., 2017; Greene & Stavins, 2018). These ten payment methods (see Table 1) are broadly categorized into three groups in the SCPC relating to the mode of the payments—paper (cash, checks, money orders, and traveler's checks), card (debit cards, credit cards, and prepaid cards), and electronic (BANP, OBBP, and deduction from income).

Table 1

Payment Methods used by Consumers in the U.S.

Mode	Payment instrument	Definition
Paper	Cash	Coins and paper bills
	Check	A piece of paper directing a financial institution to pay a specific amount of money to a person or business.
	Money Order	Purchased from a bank or other institution; allows the individual named on the money order to receive a stated amount of cash on demand.
	Traveler's Check	A traveler's check is like a check but works like cash, is protected against loss or theft, purchased in advance, and issued for a specific amount of money.
Card	Credit card	A card that allows the cardholder to purchase by borrowing funds that will be paid back to the credit card company later.
	Debit Card	A card that allows the holder to make purchases or payments by accessing funds in a bank account.
	Prepaid card	A card that stores or records a dollar value. It is also known as a stored-value card or gift card. There are also government-issued prepaid cards, such as EBT, Direct Express, SNAP, or TANF cards.
Electronic	Bank account number payment (BANP)	Payment is made by providing a bank account number to a third party, such as an employer or utility company.
	Online banking bill payment (OBBP)	Payment is made from a bank's website or mobile app that accesses funds from a customer's checking or savings account to pay a bill or pay other people. This payment does not require the bank or the customer to disclose their bank account number to a third party.
	Deduction from income	Direct payments from income—for example, automatic deductions for an employee's portion of health insurance or for transportation expenses (applies only for automatic bill payments).
Additional electronic payment methods	Mobile payments	Using a mobile phone to make any of the following: - used a mobile app to pay, used tap-and-pay at the point of sale, or scanned a Q.R. code or showed the phone to a clerk, driver, or restaurant staff at the point of sale.
	Cryptocurrencies	Virtual Currencies such as Bitcoin, XRP, Litecoin, Bitcoin Cash, Ethereum, Stellar, EOS.

Note. From "The 2020 Survey of Consumer Payment Choice: Summary Results," by K. Foster, C. Greene, and J. Stavins, 2021, *Federal Reserve Bank of Atlanta Research Data Reports, 21-1*, p. 26. Copyright 2021 by the Federal Reserve Bank of Atlanta.

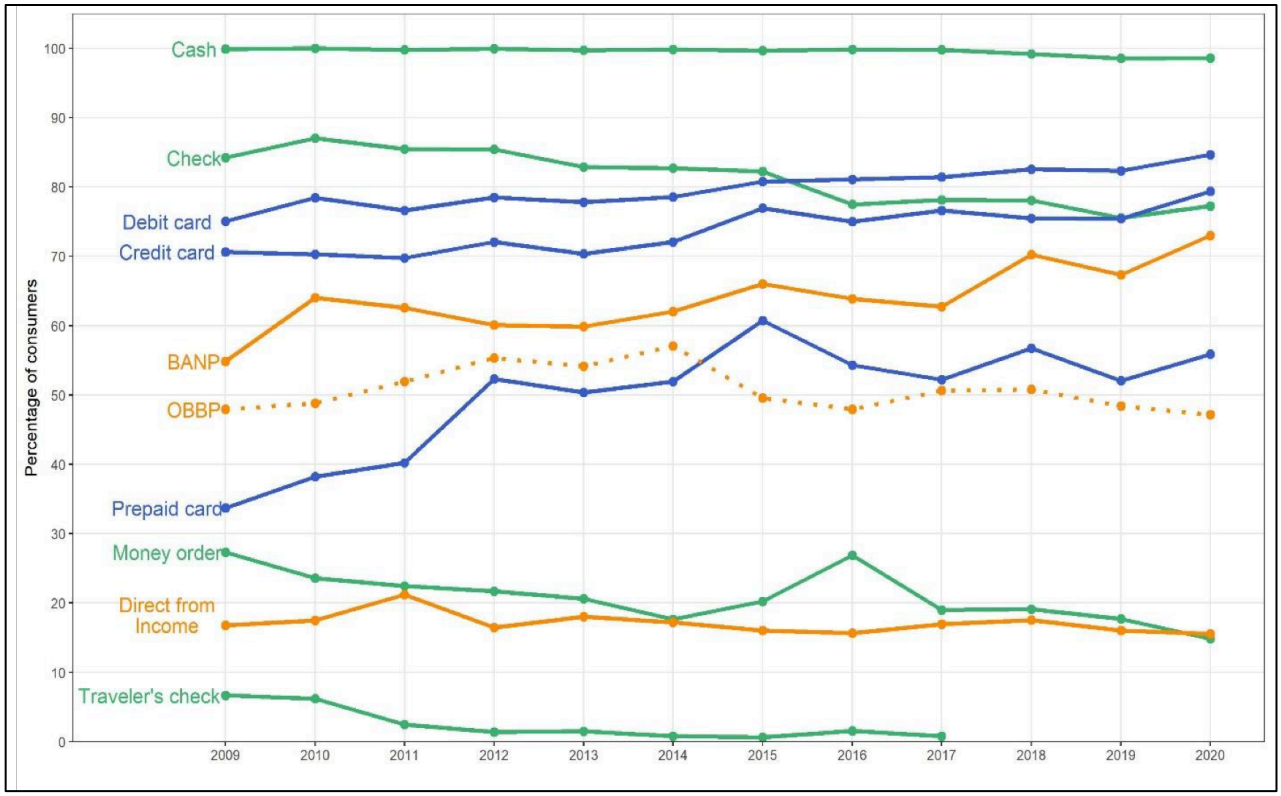
The current study combines the payment method classification commonly used in academia with one used in industry to make the discussion more comprehensive and current. Cardknox (2021), a company that offers payment integration services, provides an exhaustive categorization of prevalent payment methods. The payment methods included are cash, checks, debit cards, credit cards, transfers using Automatic Clearing House (ACH), and contactless payment methods. ACH payments are electronic payments that go through the ACH network to move funds from one bank account to another, such as when employers pay wages through direct deposit (i.e., deduction from income) and when consumers pay bills by debiting the payment directly from a checking or savings account (i.e., BANP, OBBP). Further, contactless payment is a secure method for transactions using a debit, credit, smartcard, or a mobile phone enabled with radio frequency identification (RFID) or near-field communication (NFC) technology. This technology allows two devices to communicate and exchange data when positioned close to each other, for example, a smartphone or an EMV contactless card and a payment terminal.

The classifications of payment methods from SCPC and from Cardknox are used to form payment portfolios analyzed later in the study. Payment portfolios are usually a mixed bag of paper, plastic, and electronic instruments held by consumers at any point. Figure 2 shows the percentage of adoption of different payment methods in the U.S. from 2009 to 2020. Paper instruments such as cash, checks, and money orders are the oldest payment methods available to consumers. Then there are debit cards, credit cards, prepaid cards, and ACH transfers which are ahead of paper methods in terms of technological innovation in payments. More recently, there has been a significant expansion in electronic, contactless, and paperless modes of payment and even virtual currencies like cryptocurrency (Mamonov, 2020). Consumers use contactless payments, including credit cards linked to digital wallets on mobile phones and transactions

made with a contactless EMV card using their tap-and-pay feature. These are the most technologically advanced payment methods currently available in the payments ecosystem. Thus, payment methods ranging from paper to cards to electronic payments made using ACH transfers and recently mobile payment options with smartphones or contactless cards show the trajectory from the non-electronic to the most technologically advanced payment methods. Figure 3 lays out notable payment innovations in the U.S. payment landscape from the early 2000s till 2022.

Figure 2

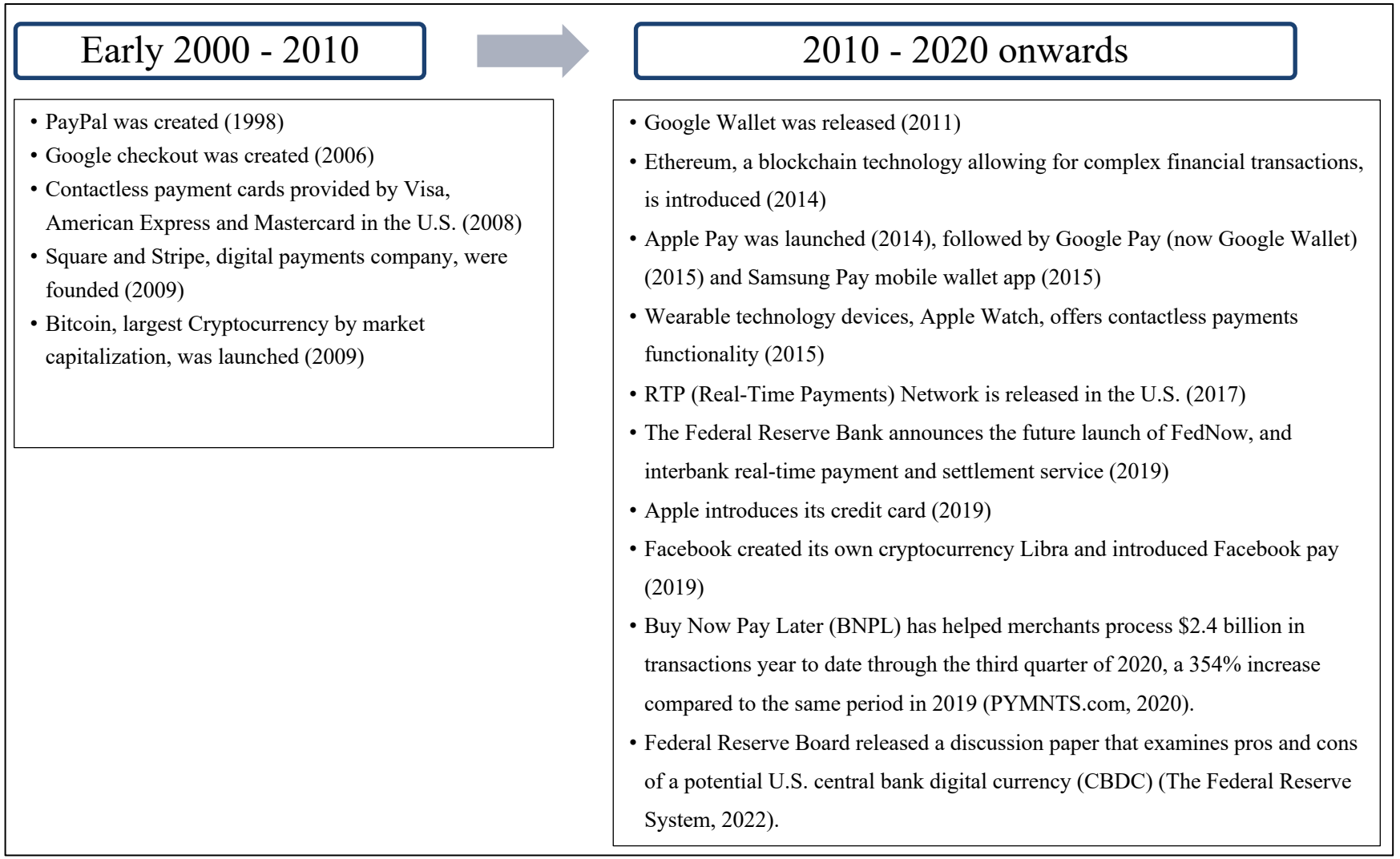
Percentage of U.S. Consumers Adopting Payment Instruments



Note. Reprinted from "The 2020 Survey of Consumer Payment Choice: Summary Results" by K. Foster, C. Greene, and J. Stavins, 2021, *Federal Reserve Bank of Atlanta Research Data Reports, 21-1* p. 9. Copyright 2021 by the Federal Reserve Bank of Atlanta.

Figure 3

Timeline of the Significant Innovations in the Payment Landscape



Note. Adapted from "Payment Methods: A Brief History and a look to the Future," *Cardknox.* Copyright 2021 by Cardknox Development, Inc.

Payment Trends in the United States

The following section discusses payment trends in the United States in two segments, before 2020 and after 2020, considering the COVID-19 pandemic as the breakoff point.

Before 2020

The payment ecosystem saw a steady decline in paper payment instruments caused by the decreasing popularity of paper checks including traveler's checks, and money orders. Checks were replaced by debit cards and electronic payments like online bill payments (Gerdes et al., 2018; Stavins, 2017). Although the share of payments made with paper instruments has steadily declined since 2015, cash continues to be among the most frequently used payment methods, along with credit cards and debit cards (Foster et al., 2019, 2020, 2021; Ke et al., 2018).

Unlike credit cards, mobile payments failed to achieve an impressive adoption in the U.S. even though the country has one of the highest smartphone ownership rates in the world (Ke et al., 2018; Rooney, 2019). Technology giants like Apple, Google, and Samsung have invested heavily to make mobile payment services available in the U.S. since 2014. The share of consumers using mobile banking, mobile apps, and mobile wallets such as Android Pay, Apple Pay, and Samsung Pay increased by 20% between 2015 and 2018 (Foster et al., 2019). Yet, the Pew Charitable Trusts, in a mobile payment survey conducted in 2019, found that 56% of the American adults surveyed made at least one mobile payment in the previous year, whereas 78% of the participants used cash, 70% used credit cards, 61% used debit cards, and 12% used prepaid cards. This is unlike peer countries such as Canada, Australia, and China, where mobile payment adoption has been much faster than in the U.S., despite the rise in ownership of mobile phones (Rooney, 2019; Trütsch, 2020).

Although originally introduced much earlier, banks and merchants in the U.S. were legally obliged to switch entirely to EMV standard payment cards by 2015. These cards enable storing data on chips rather than magnetic stripes (Trütsch, 2020). Further, newer terminals were introduced around the same time, embedded with the ability to process contactless payments (using the tap-to-pay feature). Therefore, by 2016, payment terminals that could process contactless payments became widely available (Akana & Ke, 2020). However, merchants were not eager to enable the tap-and-pay feature available as a payment option on their terminals because of the lack of contactless products in the market and the lack of uptake by consumers (Akana & Ke, 2020; Trütsch, 2020). Perhaps consumers' habits of using mobile and contactless payments had not formed then (van Hoek, 2017). Payment experts at PYMNTS (2019) theorized that contactless payments did not motivate consumers enough to move from their existing mobile payments and switch over to mobile payments. The picture has, however, changed from the onset of the COVID-19 pandemic.

2020 and After

The pandemic has paved the way for a dramatic change in the way consumers use payment methods (Lucas, 2020). Payments made online and remotely on mobile phones increased due to the COVID-19 pandemic (Kim et al., 2020). According to a report by Visa (2020), tap to pay transactions in daily segments in the U.S. including grocery and pharmacy has grown more than 100% in 2020 compared to 2019. Contactless payments made without debit or credit cards at the POS surpassed transactions made with cards present at the POS in March 2020 for the first time in the history of payments (Visa, 2020). In April 2020, the number of customers registering for mobile banking rose 200% from 2019 (PYMNTS, 2020).

The SCPC recorded that online purchases made at least once in a typical month increased by 7%, peer-to-peer mobile payment made at least once in a month increased by four percent, and general mobile payment made at least one increased about eight percent from 2019 to 2020 (Foster et al., 2021). eMarketer (2021), an analyst firm, forecasts that more than half of the U.S. smartphone owners will be using mobile payments services by 2025.

Cash usage suffered slightly during the coronavirus pandemic, but cash holdings among consumers increased as anxious consumers withdrew more cash in the days leading up to the lockdown (Kim et al., 2020). In 2020, 74% of consumers participating in the SCPC reported that they used cash at least once in a typical month, down from 82% in 2019, potentially due to consumers considering tap-and-pay and other contactless payments as the cleaner means to pay during the coronavirus outbreak (Foster et al., 2021; Mastercard, 2020). Or perhaps they avoided in-person transactions in general. Overall, Coyle et al. (2021) reported that most people did not avoid cash during the outbreak, and 75% reported not switching to paying online or by phone in 2020. Although a distinction was not made between the incidence of contact versus contactless credit card transactions, credit cards continued to be the most used payment method in 2020, followed by debit cards and cash, thus retaining their pre-pandemic popularity (Coyle et al., 2021; de Best, 2021).

Prior Research on Determinants of Payment Behavior

The massive technological advancements in the payment landscape have led to large-scale data collection, market research, and new/renewed academic interest in understanding how consumers approach payment decisions (Rysman & Schuh, 2017). The next section summarizes previous research literature on payment behavior and the determinants of payment method adoption and use.

Demographic Characteristics

Income and demographic characteristics, such as education and age, are correlated with consumers' payment behavior (Bertaut & Haliassos, 2006; Borzekowski & Kiser, 2008; Carow & Staten, 1999; Henry et al., 2015; Hogarth et al., 2004; Kim et al., 2006; Mantel, 2000; Mester, 2012; Stavins, 2002; Zinman, 2009). The consensus is that younger people use more debit cards, older people use more checks, and higher-income consumers rely more heavily on credit cards. Further, Mann (2011) analyzed the 2008 SCPC to find significant differences across age and race in payments choices. Younger consumers, more educated, and those with higher incomes are more likely to use electronic payments (Stavins, 2002). The Pew Charitable Trusts (2019) reports the same for mobile payments.

Similar results were observed from analyzing panel data from the SCPC. Connolly and Stavins (2015) found race strongly correlated with the use of payment methods. Cash and prepaid cards were used most heavily by young, Black, the least-educated, and the lowest-income consumers. Credit cards were used chiefly by older, wealthier, and more-educated individuals. Stavins (2016) found age to be positively correlated with check use and inversely correlated with debit card use. Additionally, education was observed to have a strong negative effect on cash use and a positive impact on credit cards. Men used cash much more intensively than women did. Overall, their analyses revealed that payment behavior changes slowly over time. Payment behavior in response to demographic characteristics and income does not vary in the short and medium run.

Further, Schwartz and Ramage (2014) assert that a payment choice disparity is observed across generations. Stavins (2016) found that payment behavior in response to age and birth cohorts move in the same direction. The oldest generation uses mail money orders as payment

methods versus the younger generations, who increasingly use mobile payments. The Pew Charitable Trusts (2019) finds evidence of the same in their payments survey. Seventy-four percent of respondents who used mobile payments belonged to Generation X or younger. In contrast, 62% of respondents using traditional payment methods were Baby Boomers or older. The payment methods more popular among Generation Z, the youngest all-adult generation, were prepaid cards and digital wallets (Axerve, 2021; Cruz Expósito, 2018). Generation Z represents the future of mobile wallets, with nearly 40% using mobile wallets at least a few times per month. Generation Z primarily drove the shift to digital payment methods during the ongoing COVID-19 pandemic (Raynor, 2021).

Assessment of Payment Method Attributes

Apart from the demographic characteristics of consumers, each payment method possesses exclusive attributes that are crucial when consumers choose payment methods for a transaction (Koulayev et al., 2016; Rysman, 2010; Schuh & Stavins, 2013; Stavins, 2013). A rich body of literature exists linking consumers' payment behavior to their assessment of payment method attributes (Benton et al., 2007; Hirschman, 1982; Jonker, 2007; Schreft, 2006; Schuh & Stavins, 2010; See-To et al., 2014; Von Kalckreuth et al., 2014).

Security

Consumers select security as the most essential attribute over cost, convenience, and others (Greene & Stavins, 2017; Stavins, 2013). There is also evidence that perception of security significantly affects the adoption and use of payment instruments (Koulayev et al., 2016; Schuh & Stavins, 2013; Stavins, 2013). Kosse (2013) studied the impact of newspaper articles on consumers' perception of safety of debit card use based on consumer survey data from the Netherlands. Personal preferences influenced safety assessment for payment instruments, risk

aversion, personal characteristics, and personal experiences. Further, Kahn et al. (2017) found that consumers tend to be influenced by their neighbors' perceptions of payment instrument security. However, Mantel (2000) found inconclusive results for the effect of security perceptions on consumer payment behavior.

Cost

Koulayev et al. (2016) computed elasticities of substitution across different payment instruments using data from the SCPC, examining how these change in response to changes in the costs of adoption and use. They found that cash is the most common substitute for debit cards in retail payments and checks in the case of bill payments. Further, an increase in the cost of debit cards hurts lower-income earners, while an increase in the cost of credit cards hurts high-income earners. Stavins (2018) tested the price elasticity of payment methods in a related study using the SCPC data. The study observed whether consumers are likely to deviate from their preferred ways to get a discount or avoid a surcharge. Such deviations were rare. However, consumers will use cash in response to a cash discount, even though they prefer other payment methods.

Acceptance

Huynh et al. (2014) studied the importance of payment method acceptance in terms of payment method used by consumers by hypothesizing that the lack of card acceptance at the point of sale is a key reason why cash continues to play an important role. Their results confirm that card acceptance exerts a substantial negative impact on the demand for cash. Likewise, in a study by Arango et al. (2011), cash dominates low-value transactions due to limited acceptance of other payment instruments. Rysman (2007) and Bounie et al. (2017) assert that consumer preferences, consequent usage, and merchant card acceptance are interdependent.

Convenience

Borzekowski et al. (2008) studied why consumers use debit and credit cards and found convenience to be the most essential factor associated with their use. Prior research on factors shaping consumers' perceptions toward mobile payments has detected perceived ease of use to significantly affect the adoption (Schierz et al., 2010; Teo et al., 2015). The SCPC (Foster et al., 2021) defines convenience as a quality that includes ranking positively for traits such as speed, recordkeeping, control over payment timing, ease of using, keeping, storing, carrying, getting, or setting up the payment method. Respondents of the SCPC consider credit cards and debit cards to be more convenient than cash and money orders to be the least convenient (Foster et al., 2021).

Type and Size of Transactions

Rysman and Schuh (2017) state that consumers frequently switch among payment methods from transaction to transaction. Further, consumers use different payment instruments in various contexts, for instance, paying bills with one instrument and paying for retail purchases with another. Klee (2008) found that consumer payments switch from cash to card as transaction size grows. Cohen and Rysman (2013) studied how households switch among payment instruments in relation to transaction size. Focusing on the most-favored payment instruments across twelve quarters, Cohen and Rysman (2013) found that about 85% of households do not switch their favorite, about 15% switch once, and less than one percent switch twice. Trütsch (2016) studied the impact of mobile payments on the adoption of use of other payment methods making a distinction between retail payments for goods and services and bill payments.

The above section summarizes previous literature that examines various determinants of payment behavior, including demographic characteristics of consumers, payment method

attributes, type, and the size of transactions made. The following section describes personality psychology in understanding consumer behavior and how psychologists conceptualize and measure personality traits. Later in this chapter, how personality traits can be modeled to influence consumers' payment behavior is described.

Personality Theories and Understanding Consumer Behavior

People often have different perceptions and responses to similar situations based on their personality traits (Almazroa & Gulliver, 2018). Personality psychology attempts to describe a person by studying universal traits and variations, treating each individual as a unique combination of traits (Cervone & Pervin, 2009). A renowned personality psychologist defined personality traits as "the relatively enduring patterns of thoughts, feelings, and behaviors that reflect the tendency to respond in certain ways under certain circumstances" (Roberts, 2009, p. 140). Even though an individual's personality is relatively consistent and enduring, it can change in response to significant life events as well as a part of a gradual process (Schiffman et al., 2013). Taking a mathematical approach, Almlund et al. (2011) state that personality is a response function that maps personality traits to manifest personality in individuals.

The discipline of personality psychology has evolved over the past century. Personality theories have been widely used in fields such as marketing to understand consumer behavior better. It has proven to be highly beneficial in developing a firm's market segmentation strategies (Schiffman et al., 2013). The major theories of personality used in understanding consumer behavior fall under motivation research founded on Sigmund Freud's psychoanalytic personality theories, the Neo-Freudian theory due to Adler (1964), Sullivan (1953), and Horney (1967), and trait theory due to Allport (1967), Eysenck (1946), Cattell (1946), and McCrae and Costa (1992) (Schiffman et al., 2013; Hogan and Sherman, 2020).

The earliest approach to the formal study of personality was psychoanalysis, the creation of Sigmund Freud, who began his work at the end of the 19th century (Schultz & Schultz, 2016). Motivation research theory, developed by Freud, was built on the premise that consumer behavior is dictated by unconscious or deeply hidden needs and drives (Kozinets, 2010). Commodity-specific characteristics are instrumental in appealing to and stimulating these unconscious drives, resulting in consumers purchasing them. Following Freud's psychoanalytic theories yet breaking off from it, several psychologists such as Adler (1964), Sullivan (1953), and Horney (1967) proposed that a combination of both social (e.g., family, society, wealth, and region, etc.) and individual psychological factors play a crucial role in shaping the personality of individuals and their consumer-centric motivations (Schiffman et al., 2013). The other major theory used in consumer behavior research, the one used in this study, is trait theory discussed below.

Trait Theory and Understanding Consumer Behavior

Trait theory, a quantitative take on personality psychology, is a significant departure from the previous theories in the discipline of personality psychology which were primarily qualitative. The proposition that an individual's personality potentially causes variations in consumer behavior led to a large volume of marketing and consumer behavior research beginning in the 1960s (Foxall & Goldsmith, 1988). Personality traits have been instrumental in exploring diversity among consumers (Schiffman et al., 2013). Applications of trait theory in studying consumer behavior have been used to explain consumer innovativeness (Lassar et al., 2005; Park et al., 2010), consumer ethnocentrism (Kwak et al., 2006), and consumer materialism (Ahuvia and Wong, 2002). Consumer innovativeness refers to the tendency of consumers to adopt a good or service earlier than most others (Dobre et al., 2009). Consumer ethnocentrism is

a psychological concept that describes how consumers purchase and consume goods based on their countries of origin. Finally, consumer materialism refers to the trait in consumers where they believe that the purchases they make are a part of their identity.

Moreover, personality traits play a crucial role in risk-taking and bullish behavior (Fung & Durand, 2014). Hence, it is not surprising that personality traits have been widely studied to explain financial behaviors, such as participation in the stock market and making investment choices (Bucciol & Zarri, 2017; Chitra & Ramya Sreedevi, 2011; Oehler et al., 2018), level of debt and assets held (Brown & Taylor, 2014; Walczak & Borkan, 2016), compulsive buying (Donnelly et al., 2012), impulsive buying (Bratko et al., 2013; Shahjehan et al., 2012), and household savings behavior (Gerhard et al., 2018). The Five-Factor Model of personality traits (Costa & McCrae, 1992; Goldberg, 1990) and, in a few cases, the Myers-Briggs Type Indicators (MBTI) (Myers et al., 1985) have been used to study personality traits associated with financial behaviors.

Trait theory empirically measures individual differences by using scores on specific personality measures to predict consumer behavior (Haugtvedt et al., 1992). At the inception of research on personality traits, researchers provided exhaustive lists of numerous likely traits and lacked a formally accepted categorization of the traits (John et al., 2008). The discipline of personality psychology needed a descriptive model and a taxonomy of traits (John & Srivastava, 1999). During the first half of the twentieth century, many prominent psychologists studied personality traits, intelligence, interests, and motivation and measured differences and similarities within and across individuals. Over the years, especially in the latter half of the twentieth century, researchers formalized and validated the classification of personality traits

(Costa & McCrae, 1992; Goldberg, 1990). Allport (1967) was one of the earlier pioneers of trait theory. Psychologists eventually developed many theories and scales (John et al., 2008).

Trait theorist Raymond Cattell (1946) reduced the number of primary personality traits from Allport's initial list of over 4000 down to 171 traits. Using factor analysis, Cattell reduced the list to just 16 key personality traits. Subsequently, using factor analysis, Eysenck (1967) suggested that personality is reducible to three major traits: Neuroticism, Extroversion, and psychoticism. This came to be popularly called Eysenck Personality Questionnaire (EPQ) or the three-factor model. Both Cattell's and Eysenck's theories led to the discussion that Cattell focused on too many traits while Eysenck focused on too few (Cherry, 2022). Subsequent research in this field gave rise to a more comprehensive and universally accepted Five-Factor model of personality traits, commonly known as the "Big Five," discussed in the next section.

Five-Factor Model of Personality or the "Big Five" Personality Traits

The Five-Factor model has its origins in Allport and Odbert's (1936) linguistic hypothesis, which posits that the most critical individual differences are encoded in language. Allport and Odbert (1936) searched English dictionaries and found 17,953 personality-describing words, later reduced to 4,504 adjectives that describe personalities. Subsequently, several psychologists working independently and on different samples concluded that personality traits could be organized into five superordinate factors. This is the most widely accepted taxonomy of personality traits. The present study examines how the Big Five personality traits influence payment behavior. Table 2, shown below, introduces the Big Five personality traits.

Table 2

Facets and Definitions of the Big Five Personality Traits

Traits	Facets	Definitions	American Psychological Association Dictionary (2007) Definitions
Extroversion	Warmth, Gregariousness, Assertiveness, Activity, Excitement seeking, Positive emotions	The degree to which a person needs attention and social interaction	An orientation of one's interests and energies toward the outer world of people and things rather than the inner world of subjective experience; characterized by positive affect and sociability.
Agreeableness	Trust, Straight-forwardness, Altruism, Compliance, Modesty, Tender-mindedness	The degree to which a person needs pleasant and harmonious relations with others	The tendency to act in a cooperative, unselfish manner.
Conscientiousness	Competence, Order, Dutifulness, Achievement striving, Self-discipline, Deliberation	The degree to which a person is willing to comply with conventional rules, norms, and standards	The tendency to be organized, responsible, and hardworking.
Neuroticism	Anxiety, Angry hostility, Depression, Self-consciousness, Impulsiveness, Vulnerability	The degree to which a person experiences the world as threatening and beyond their control	It is a chronic level of emotional instability and proneness to psychological distress. Emotional stability is predictability and consistency in emotional reactions, with an absence of rapid mood changes.
Openness to Experience	Fantasy, Aesthetics, Feelings, Actions, Ideas, Values	The degree to which a person needs intellectual stimulation, change, and variety	The tendency to be open to new aesthetic, cultural, or intellectual experiences.

Note. From "Revised NEO personality inventory (NEO PI-R) and NEO five-factor (NEO-FFI) inventory professional manual," P. T. Costa Jr., & R. R. McCrae, 1992*, Odessa, Fl: PAR*; "Motives, values, preferences inventory manual," J. Hogan, & R. Hogan, 1996, *Hogan Assessment Systems*, *Tulsa, OK;* "APA dictionary of psychology," G. R. VandenBos, 2007, American Psychological Association.

The Five-Factor Model (Costa & McCrae, 1992; Goldberg, 1990) depicts a structure of individual differences in human behavior. Personality traits can be categorized into five orthogonal factors of personality, commonly called the "Big Five." It captures personality using five higher-order traits: Extroversion, Agreeableness, Conscientiousness, Neuroticism, and Openness to Experience.

The Five-Factor Model is rooted in biology and is genetically based. The prominence of Big Five personality traits arises from the fact that they are comprehensive and are unanimously accepted. The five personality traits and their respective facets are described in Table 2. John (1990), Goldberg (1993), and Costa and McCrae (1992) present evidence that most of the variables used to assess personality traits in academic research in the field of personality psychology can be mapped into one or more of the dimensions of the Big Five. They argue that the Big Five are at the crux of all personality traits, by which all more narrowly defined traits may be categorized. The following section describes the prior use of trait theory to explain payment behavior.

Trait Theory and Understanding Payment Behavior

Many financial behaviors, such as participation in the stock market and making investment choices, compulsive buying, impulsive buying, and household savings behavior, explained by personality traits, potentially involve using payment methods. However, it is currently unknown how similar consumers are when adopting and using payment methods to complete transactions in terms of their personality.

Previous studies primarily examined consumers' personality traits to explain electronic payment adoption, especially mobile payments (Agyei et al., 2020; Almazroa & Gulliver, 2018; Khan et al., 2019). The adoption of payment innovations like mobile payments depends heavily

on personal innovativeness. Researchers have linked personal innovativeness to consumers' personality traits (e.g., Yang et al., 2011; Yoon & Steege, 2012). Before using personality traits, researchers found factors such as compatibility, "the degree to which mobile payment is reconcilable with existing values, behavioral patterns, and experiences" of consumers, to be a significant predictor of the use and adoption of mobile payments (Schierz et al., 2010, p. 210). This prompted a few researchers, e.g., Almazroa and Gulliver (2018), to examine mobile payments by accounting for consumers' personality traits using the Big Five personality traits. They theorized a mobile payment continuation model that incorporated personality traits to explore the continued usage of mobile payments. Their model captures and compares two perceptions of mobile payment use, pre-usage expectation and post-usage beliefs. Although the model has not been theoretically tested, it posits that the relationship between the exogenous variables in the framework and the behavioral intention to use mobile payments is potentially moderated by the Big Five personality traits (see Table 2).

Advancing this area of research, Khan et al. (2019) examined the impact of personality traits on mobile payment adoption by collecting data from mobile payment users in China. Using a combination of structural equation analysis with a neural-network approach, their study finds that among the Big Five personality traits, Conscientiousness and Agreeableness are the two main predictors of mobile payment adoption. In another similar study, Agyei et al. (2020) examined the effect of personality traits on adopting mobile banking services by users in Ghana. The results show that Agreeableness, Conscientiousness, and Openness to Experience significantly impact users' intention to adopt mobile banking through the perceptions of usefulness and ease of use. Agreeableness was observed to be the strongest predictor, followed by Conscientiousness.

Understanding Payments Behavior using Technology Acceptance Models

There has been a radical shift away from cash toward digital payments, with e-commerce and m-commerce emerging as the primary purchasing channels. Purchase of goods and services has increasingly involved cashless or contactless payment methods, accelerated further by the COVID-19 pandemic. Thus, it is natural that prior research exploring the adoption and use of payment methods used various technology acceptance models.

Previous research exploring the adoption and use of payment methods using technology acceptance models rested on two theoretical frameworks – Innovation Diffusion theory (Rogers, 1962) and the theories focusing on human behavior, such as the Technology Acceptance Model (TAM) (Davis, 1989), Theory of Planned Behavior (TPB) (Ajzen, 1991), and the combination of TAM and TPB (Safeena et al., 2013). Subsequently, the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003) framework was introduced, which provides a model that explains the acceptance and use of different technological innovations and systems. It captures the essence of several technology acceptance models, thereby contributing substantially to technology acceptance and usage literature. More recently, Venkatesh et al. (2012) extended the UTAUT by tailoring it to the context of consumer acceptance and use of technology and called it UTAUT2. Prior research using UTAUT and UTAUT2 appropriately conceptualizes acceptance and use of electronic payments.

The use of personality traits in explaining technology adoption is not new. Zmud (1979) introduced the idea that individual differences, including personality traits, impact the use of IT. His study assesses the influence of individual differences on the success of different Management Information Systems (MIS) and concludes that individual differences significantly affect MIS's success. Zmud defined personality variables as the cognitive and emotional

structures used to understand people and situations. Harrison and Rainer (1992) use this categorization to understand individual differences in end-user computing skills. These studies are fundamental in introducing and explaining the role of personality in technology use.

While the UTAUT framework received much recognition as a comprehensive framework to explain technology acceptance, researchers such as Sharma et al. (2004), Wang and Yang (2005), and Devaraj et al. (2008) soon recognized that little attention was given to individual traits in these frameworks. They comprised the next set of the many researchers who studied personality traits using the Big Five personality traits associated with technology acceptance models such as UTAUT or TAM. Devaraj et al. (2008) wanted to incorporate personality traits in explaining the use of technology, a construct that was so far ignored in technology acceptance research. Using data from new users of a collaborative technology, their study found that personality traits could help explain the intention to use and, consequently, use behavior. Devaraj et al. (2008) found that personality traits directly impacted perceived usefulness and subjective norms, personality traits moderated the relationship between perceived usefulness and intention to use and moderated the relationship between subjective norms and intention to use technology. Apart from Openness to Experience, all of the other personality traits significantly impacted intention to use. Sharma et al. (2004) applied the Big Five personality traits to study the adoption of IT using the UTAUT. Their study identified personality traits as potential moderators of the relationship between the exogenous constructs and the intention to use IT. Similarly, using UTAUT, Wang and Yang (2005) studied the influence of differences in personality traits in the case of online stock trading using the UTAUT framework. Their model showed that personality traits were represented better as moderators than as separate exogenous constructs.

Operationalizing Personality Traits to Explain Payment Behavior

Millions of users have adopted paper, plastic, electronic, and contactless payment methods. And some even have a favorite payment method that they regularly use (Rysman, 2013). However, it is currently unknown how similar consumers are, in terms of their personality, when adopting and using a particular combination of payment methods in their portfolio. The focus of this study is to examine how personality traits influence payment choices by consumers using the Big Five personality traits. Advancing research in this area, the following section hypothesizes about the Big Five personality traits concerning adopting and using payment methods as a foundation for the econometric model and estimation.

Payment behavior is analyzed focusing on two aspects. First, if consumers carry at least one of each of the four types of payment methods (paper, cards, ACH transfers, and contactless mobile payments) in their portfolios, the portfolios are considered to be diverse. Second, if the portfolios include both ACH transfers and mobile payments or only mobile payments, the portfolios are considered to be technologically advanced.

Extroversion

Extroverts have many friends and enter relationships without any inhibitions (Jacques et al., 2009). Numerous studies have examined the role of Extroversion within Information System (IS) contexts, hypothesizing that Extroversion is positively related to the actual and perceived use of the technology (Barnett et al., 2015; Rosen & Kluemper, 2008). Further, it has been found that Extroversion is the most significant driver of consumer engagement in the online brand community (Islam et al., 2017). Therefore, in this context, individuals ranking higher on the Extroversion scale are more optimistic and may be potentially more inclined to adopt and use technologically advanced payment methods such as ACH transfers and mobile payments.

Agreeableness

Highly agreeable individuals are likely to project prosocial behaviors. They care about the benefit of others, are trusting of others, and avoid conflict (Jacques et al., 2009). Since people who demonstrate Agreeableness also value getting along with others, they may be open to holding diverse payment portfolios including at least one payment method of each type – paper, cards, ACH transfers, and mobile payments. Additionally, previous literature claims that agreeable individuals are more likely to consider social networking to be a helpful technology. Therefore, they may also be more likely to be adopters and users of payment methods such as peer-to-peer transfers using mobile payments.

Conscientiousness

Given the solid motivation of conscientious individuals to be tidy, self-disciplined, and determined, they are likely to ensure that their payment transactions are efficient, considering more technologically advanced payment methods like mobile payments or contactless payments. Khan et al. (2019) found Conscientiousness to be the primary predictor of mobile payment adoption. Therefore, it is hypothesized that conscientious individuals will hold and use mobile payments Individuals who rank high on the Conscientiousness scale are presumed to hold fewer (have a less diverse portfolio) but well-established payment methods to conduct transactions efficiently.

Neuroticism

Korukonda (2005) and Barnett et al. (2015) found that Neuroticism is positively related to technophobia, and computer anxiety may diminish users' intention to use new and existing technology. Neurotic users tend to consider any new technological innovations as threatening and a mentally taxing process (Soltani et al., 2013). Likewise, they may have negative feelings

toward adopting and using technologically advanced payment methods (ACH transfers and mobile payments) and instead value using tried and tested methods (paper and cards).

Openness to Experience

Since openness in users causes them to be more friendly to innovative ideas and experiences, they are expected to hold a positive approach toward adopting new technologies (Yoon & Steege, 2013). Individuals exhibiting Openness to Experience are more intellectually curious than their peers. Thus, a novel way to make transactions is appealing to them. Therefore, people ranking higher in the openness scale tend to carry more technology-advanced payment methods and to have a diverse portfolio.

Hypotheses

Based on the detailed review of the literature and conceptual model, the following research questions and hypotheses are proposed:

- RQ1: How do personality traits influence payment portfolio selection?
    - H1. Except for Neuroticism, all personality traits are positively associated with holding a more technologically advanced portfolio.
    - H2. Except for Neuroticism and Conscientiousness, all personality traits are positively associated with holding a more diverse portfolio.
- RQ2: How do personality traits influence the use of payment methods from a portfolio?
    - H3. All Personality traits but Neuroticism are positively associated with using more technologically advanced payment instruments.

The next chapter describes the data and the methodology followed to answer the above research questions and to test the hypotheses.

CHAPTER 3

METHODOLOGY

This study aims to understand the effect of personality traits on the choice of a payment portfolio and the subsequent use of the payment methods in that portfolio. Hypotheses concerning the Big Five personality traits and adoption and use of payment portfolios are tested. Chapter 3 begins with a description of the data used for the analyses and the sample considered for the study. Following this is the description of payment portfolios held by consumers, how these portfolios were formulated for each consumer, and finally categorized for further analyses. Next, the variables included in the study are described and presented in Table 7, followed by a discussion of the estimation strategy and the econometric model analyzed.

Data

SCPC

A panel of six consecutive years of SCPC data from 2015 through 2020 is used in this study. The SCPC collects detailed information on consumer payment behavior, including adopting and using payment instruments, bank account ownership, and cash holdings and withdrawals. It also contains information on consumer attitudes toward different features of payment instruments and relevant household and demographic characteristics. Payment behavior includes adopting and using the following payment instruments: cash, check, money order, credit card, debit card, prepaid card, BANP, and OBBP (see Table 1). It also includes information on the adoption and use of mobile payments and cryptocurrencies. Respondents report their payment behavior in a typical month, including retail transactions for goods and services (both

in-person and online), bill payments, and person-to-person transactions. The SCPC provides sampling weights chosen to match the Current Population Survey (CPS) so that weighted aggregate SCPC data are representative of the U.S. population.

The SCPC has been managed and disseminated annually by the Federal Reserve Bank of Atlanta, Boston, and San Francisco since 2008 (Foster et al., 2021). The SCPC was conducted using the RAND Corporation's American Life Panel (ALP) from 2008 through 2014. Since 2015, it has been part of the Understanding America Study (UAS), managed by the University of Southern California (USC) Dornsife Center for Economic and Social Research (CESR). Both panels are nationally representative of the U.S. population. In addition, the SCPC will be merged with a survey that is a part of the UAS panel to study the impact of personality traits on payment choices made by consumers. Although SCPC data are available from 2008, this study uses SCPC data for the years available on the UAS website to be merged with another UAS survey as described below.

UAS Survey

To incorporate personality traits, the SCPC must be combined with the UAS survey titled, "UAS1: Financial Literacy; Personality; Understanding Probabilities; Numeracy." This survey asks about respondents' financial literacy, personality traits, and understanding of probabilities and numeracy. Data on the Big Five personality traits are obtained from UAS1 and discussed later in this chapter.

Sample size

Merging waves 2015 through 2020 of the SCPC and the UAS1 survey results in an unbalanced panel with 15,388 responses. The distinct number of respondents in the panel is

4,613. As the number indicates, this panel is one with gaps, meaning that responses are not available for respondents for all the six waves of the survey considered in this study.

Incorporating the most recent wave of 2020 is crucial for understanding the adoption and use of payment methods, given the acceleration in uptake of technologically advanced payment methods due to the onset of the COVID-19 pandemic (Global Payments, 2020). Analyses are done using the unbalanced panel consisting of payment information from 2015 through 2020.

Table 3

Number of Respondents by Waves of the SCPC

	Survey Waves					
	2015	2016	2017	2018	2019	2020
Number of respondents	1,425	3,400	3,097	3,111	2,995	1,360

Measures

Payment Portfolio

The SCPC asks consumers about adoption and use of the following payment instruments: cash, checks, money orders, debit cards, credit cards, prepaid cards, OBBP, BANP, and income deduction and collects information on two other newer payment methods such as mobile payments (tap-and-pay, mobile wallets, and payment by scanning QR codes) and cryptocurrency.

As previously mentioned, the payment methods to be considered in this study are consistent with the classification prevalent in the payment industry and academic research (Foster et al., 2019, 2020, 2021). This study considers seven types of payment methods. They are cash, checks and money orders, debit cards, credit cards, prepaid cards, ACH payment methods, and mobile payment methods. ACH payments move funds from one bank account to another,

including the bank account number payments (BANP) and online banking bill payments (OBBP). Since a tiny proportion of the survey participants use cryptocurrencies, it was eliminated from the payment methods considered for the analyses. The SCPC suggests that researchers use the aggregated "adopter" variables to analyze the payment adoption variables. For example, the cash adoption variable was used by combining the variables that ask the respondents about the number of payments (retail payments, non-retail payments, and in-person bill payments) they made with cash in the last year. A similar exercise is conducted for the other payment methods.

Table 4 shows the weighted proportion of the population holding of the payment methods across the six waves. Cash is held by almost the entire sample population, followed by payment methods using checks and money orders, debit cards, credit cards, prepaid cards, and ACH transfers. Similar to Koulayev et al. (2016), adoption of debit cards in this study is only about 80%, though banks readily distribute debit cards with a debit payment feature as soon as a customer opens a checking account. In addition to misreporting, Koulayev et al. (2016) mention that this is also due to some people telling their bank that they do not want a debit card.

Across the years, it can be noted that cash holding has a decreasing trend though this decline is minimal. The adoption of checks and money orders has a more remarkable decreasing trend as the adoption rates of these paper instruments decreased by around 7% from 2015 to 2020. Adoption rates of payment methods using ACH and mobile payments have been rising across the six waves of data. The increase in mobile payment adoption has been much greater from 2015 to 2020, while payment methods using ACH transfers are already established payment methods with substantial adoption rates. The adoption rates computed from the sample population are in sync with the trends shown in Figure 3, validating these calculations.

Table 4

Adoption of Various Payment Methods (2015 – 2020)

	Survey Waves						
	2015	2016	2017	2018	2019	2020	χ^2
Cash	99.92%	99.64%	99.23%	99.79%	99.55%	99.54%	4.06
Check and Money order	81.84%	81.18%	78.90%	79.34%	77.89%	74.25%	37.05***
Debit Card	78.37%	79.05%	77.33%	81.61%	80.31%	81.80%	18.53***
Credit Card	75.12%	75.91%	76.21%	76.54%	77.41%	76.79%	5.11
Prepaid Card	53.51%	50.68%	52.97%	57.17%	49.82%	54.90%	42.48***
ACH	80.12%	82.96%	82.61%	83.98%	82.59%	84.42%	8.65
Contactless Mobile Payment	20.95%	20.07%	29.63%	30.38%	29.71%	35.48%	200.24***
N	1,425	3,400	3,097	3,111	2,995	1,360	

Note. Weighted percentages presented. Chi-square statistics are reported showing significantly different adoption rates across the waves for four payment methods.

*** p<0.01, ** p<0.05, * p<0.1

In addition to average adoption percentages, this current study examines the payment methods held together in a portfolio by consumers. The idea of payment portfolios is drawn from Koulayev et al. (2016). However, their study is cross-sectional, unlike the panel data analysis in this study. As identified by Koulayev et al. (2016), the adoption of payment methods is dynamic. Consumers may adopt a new payment method, discover ways to use it efficiently, and replace the older payment methods with the new payment method. These interesting patterns are observable only when there are data for the same individual over time. The purpose of the current study is to observe these patterns, if any.

Construction of Payment Portfolios

A payment portfolio set P_i of individual I at time t is a vector of the seven payment methods held ($p_{1i,}$ …, p_{7i}). p_1 is cash, p_2 represents checks and money orders, p_3 is debit cards, p_4 is credit cards, p_5 is prepaid cards, p_6 represents payment methods using ACH, and finally, p_7 represents mobile payments. A payment portfolio, P_i = (CA, CC, PP, ACH, MP) of the i^{th} individual shows that she is an adopter of cash but does not carry checks and money orders or debit cards. Additionally, the i^{th} individual holds credit cards, prepaid cards, ACH payment methods, and mobile payments. Table 5 shows the adoption rates of the ten most popular payment portfolios. Following Koulayev et al. (2016), Table 5 shows the top 10 payment portfolios out of the 82 portfolios held by the sample population. The complete list of payment portfolios is available in Appendix A (Table A.1). The ten most popular portfolios cover over 70% of the population. The most common payment portfolio is the one that contains all the payment methods except for mobile payments. An exploratory trend analysis is conducted for these ten payment portfolios, and the results are discussed in detail in Chapter 4.

Table 5

Population Holdings of the Top 10 Payment Portfolios (N = 15,388)

No.	Percentage	Cash (CA)	Checks/ Money Orders (CHMO)	Debit Cards (DC)	Credit Card (CC)	Prepaid Cards (PC)	ACH (e.g., OBBP, BANP)	Contactless mobile payments (MP)
1	18.27	1	1	1	1	1	1	0
2	17.34	1	1	1	1	0	1	0
3	11.46	1	1	1	1	1	1	1
4	6.15	1	1	1	1	0	1	1
5	3.08	1	1	1	0	1	1	0
6	3.03	1	1	0	1	0	1	0
7	2.97	1	0	1	1	0	1	0
8	2.86	1	1	0	1	1	1	0
9	2.86	1	1	1	0	0	1	0
10	2.68*	1	0	0	0	0	0	0

Note. Weighted percentages presented. A "1" indicates respondents hold this payment method in their payment portfolio.

*Subsequent portfolios adopted by < 2% of the population.

Classification of Payment Portfolios into Four Categories

The 82 payment portfolios were grouped into four categories to avoid subsequent econometric analyses from including many categories. This categorization was made using the classification of payment methods in SCPC. Payment portfolios were grouped into four categories as shown in Table 6. The categories represent the degree of technological advancement in the types of payment instruments one is willing to adopt with the first category being the least and the fourth category being the most technologically advanced. All combinations of portfolios comprising cash, checks and money orders, and prepaid cards (CA, CHMO, PC) are included in the first category. This category comprises the most primitive payment portfolios and consists primarily of paper payment methods. Portfolios consisting of either debit cards or credit cards with the optional addition of cash, checks and money orders, and prepaid cards make up the second category. Third, portfolios consisting of methods using ACH transfers with the optional addition of cash, checks and money orders, debit cards, credit cards, and prepaid cards are considered. Finally, all combinations of portfolios involving mobile payment methods with the optional addition of all other payment methods make up the fourth category. The fourth category consists of the most technologically advanced payment portfolios.

Frequency of use of payment method

For this study, the frequency of using cash, checks and money orders, debit cards, credit cards, prepaid cards, and ACH (BANNP and OBBP) available with the SCPC is used. The number of payments made with a particular payment method in a month is used for this study. The frequency of mobile payments is not recorded and hence not incorporated at the use stage of the model.

Table 6

List of Payment Portfolios in the Four Categories (N = 15,388)

No.	Payment Portfolios, P_i (CA, CHMO, DC, CC, PC, ACH, MP) †	Percentage (within category)
Category 1: Paper-based Payment Portfolios		
1	CA	39.72
2	CA,CHMO,PC	24.56
3	CA,PC	22.49
4	CA,CHMO	13.19
Category 2: Card-based Payment Portfolios		
1	CA,CHMO,DC,CC	18.47
2	CA,CHMO,DC,CC,PC	13.90
3	CA,CHMO,CC	10.50
4	CA,CHMO,CC,PC	10.08
5	CA,CHMO,DC	9.02
6	CA,CHMO,DC,PC	8.42
7	CA,DC	7.04
8	CA,CC	6.09
9	CA,CC,PC	5.15
10	CA,DC,CC	4.24
11	CA,DC,PC	3.71
12	CA,DC,CC,PC	3.02
13	CHMO,DC,CC	0.20
14	DC	0.08
15	CHMO,DC	0.04
16	CHMO,DC,PC	0.03
17	CHMO,DC,CC,PC	0.02
Category 3: Payment Portfolios with ACH transfers		
1	CA,CHMO,DC,CC,PC,ACH	31.86
2	CA,CHMO,DC,CC,ACH	30.24
3	CA,CHMO,DC,PC,ACH	5.37
4	CA,CHMO,CC,ACH	5.29

No.	Payment Portfolios, P_i (CA, CHMO, DC, CC, PC, ACH, MP) †	Percentage (within category)
Category 3: Payment Portfolios with ACH transfers (continued)		
5	CA,DC,CC,ACH	5.19
6	CA,CHMO,CC,PC,ACH	4.98
7	CA,CHMO,DC,ACH	4.98
8	CA,DC,CC,PC,ACH	3.32
9	CA,DC,PC,ACH	2.56
10	CA,DC,ACH	2.23
11	CA,CC,ACH	1.17
12	CA,CC,PC,ACH	0.62
13	CA,CHMO,ACH	0.54
14	CA,CHMO,PC,ACH	0.50
15	CA,PC,ACH	0.32
16	CHMO,DC,CC,ACH	0.31
17	CA,ACH	0.27
18	CHMO,DC,CC,PC,ACH	0.14
19	CHMO,CC,ACH	0.05
20	DC,ACH	0.03
21	DC,CC,PC,ACH	0.03
22	CC,ACH	0.01
23	PC,ACH	0.01
24	DC,CC,ACH	0.00
Category 4: Payment Portfolios with Mobile Payments		
1	CA,CHMO,DC,CC,PC,ACH,MP	41.81
2	CA,CHMO,DC,CC,ACH,MP	22.42
3	CA,CHMO,DC,PC,ACH,MP	5.93
4	CA,DC,CC,PC,ACH,MP	5.43
5	CA,DC,CC,ACH,MP	4.26
6	CA,CHMO,CC,PC,ACH,MP	2.89
7	CA,CHMO,DC,ACH,MP	2.45
8	CA,DC,PC,ACH,MP	2.25
9	CA,CHMO,CC,ACH,MP	1.78
10	CA,DC,ACH,MP	1.43

No.	Payment Portfolios, P_i (CA, CHMO, DC, CC, PC, ACH, MP) †	Percentage (within category)
Category 4: Payment Portfolios with Mobile Payments (continued)		
11	CA,CHMO,PC,MP	1.35
12	CA,PC,MP	1.02
13	CA,CHMO,PC,ACH,MP	0.65
14	CA,CC,ACH,MP	0.62
15	CA,CC,PC,MP	0.59
16	CA,CC,PC,ACH,MP	0.47
17	CA,CHMO,DC,CC,MP	0.45
18	CA,CHMO,CC,MP	0.43
19	CA,CHMO,DC,PC,MP	0.42
20	CA,CHMO,CC,PC,MP	0.37
21	CA,CHMO,MP	0.36
22	CA,CHMO,DC,CC,PC,MP	0.34
23	CA,PC,ACH,MP	0.34
24	CA,DC,MP	0.31
25	CA,DC,PC,MP	0.27
26	CA,DC,CC,MP	0.27
27	CA,CHMO,DC,MP	0.23
28	CA,CC,MP	0.21
29	CA,CHMO,ACH,MP	0.19
30	CHMO,DC,CC,PC,ACH,MP	0.14
31	CA,MP	0.13
32	CA,DC,CC,PC,MP	0.09
33	CA,ACH,MP	0.07
34	CHMO,DC,CC,ACH,MP	0.03
35	CHMO,DC,PC,ACH,MP	0.01
36	CHMO,CC,PC,ACH,MP	0.01

Note. The percentages are the adoption rates in the particular category.

†CA denotes Cash, CHMO stands for Check and Money Order, DC is Debit Card, CC is Credit Card, PC is Prepaid Card, ACH consists of BANP (Bank Account Number Payments) and OBBP (Online Banking Bill Payments) transfers, and MP denotes Contactless Mobile Payments.

Personality Traits

The Big Five personality traits indicator assesses the personality traits of the respondents. It consists of 44 questions in total (Costa & McCrae, 1999; McCrae, 2004), for example, “I am someone who can be moody.” And “I am someone who does things efficiently.” Respondents were asked to score each question on a scale of 1 to 5, 1 = “Disagree strongly” and 5 = “Agree strongly.” The UAS provides a scoring sheet for the Big Five personality traits to reverse score a few of the 44 questions. After reverse scoring, the total score earned were computed to measure the degree of each of the traits across consumers, E for Extroversion, A for Agreeableness, C for Conscientiousness, N for Neuroticism, and O for Openness to Experience. The complete list of questions is available in Appendix A (see Table A.2).

Payment Method Attributes

Each payment method possesses exclusive attributes crucial for consumers when choosing a payment method for a transaction. The attributes are acceptance of the payment method, its cost, convenience of using the payment method at the POS, associated risks, getting and setting up the payment method, and finally, availability of payment records. The SCPC asks participants how they evaluate payment methods across these six characteristics on a scale of 1 to 5. Higher numbers represent a more favorable property of the attribute. These questions are asked for cash, checks and money orders, debit cards, credit cards, prepaid cards, and ACH transfers (BANP and OBBP), but not for mobile payments. Therefore, this study considers the attribute-specific questions for the available payment methods.

Types of Transactions

The type of transactions often dictates the use of payment methods at the point of sale. It could be particularly relevant in understanding payment behavior at the usage stage (intensive

margin). The types of transactions recorded by the SCPC are bill payments (automatic, online, or in-person), retail payments for goods and services made in-person, and online (non-bill) payments for the purchase of goods and services made with different payment methods. To control these, dummy indicators are included in the analyses.

Demographic Characteristics

There is substantial evidence that demographic characteristics collectively explain consumers' payment behavior to a great extent (Stavins, 2016). To understand consumers' payment behavior, the econometric analysis conducted in this study controls the following demographic characteristics of the respondents – age, gender, income, race, education level, employment status, whether born in the United States, and the census region.

The analyses will account for some of the experiences related to payment behavior. These are the respondent's financial literacy, whether the respondent has declared bankruptcy, and whether a respondent has been the victim of identity theft or other fraudulent payment method-related scams. The measures of all of the variables included in the study are provided in Table 7.

Econometric Model

Drawing on the works by Schuh and Stavins (2010), Kouyalev et al. (2016), Stavins (2016), and Trütsch (2016), the model proceeds in two stages. In stage 1, the consumer picks which payment methods to adopt and forms their portfolio, P_i. In the next stage, stage 2, the consumer decides which adopted payment method to use from their portfolio when faced with different payment opportunities. A two-stage model is appropriate in such a setting as consumers have to apply for the payment method to use it. In this study, following Kouyalev et al. (2016) and Trütsch (2016), these two stages are modeled independently and sequentially.

Table 7

Measures of Variables Included in the Study

Variables	Description and coding
Payment portfolio adoption	1 = yes, 0 = no, for each of the seven payment method categories (cash, check and money order, debit card, credit card, prepaid cards, ACH payment methods, and mobile payment methods) to compute the payment portfolio
Payment portfolio category	= 1 for portfolios with all combinations of CA, CHMO, PC; = 2 for portfolios with DC, CC, and all combinations of CA, CHMO, PC; 3 = for portfolios with ACH and all combinations of CA, CHMO, DC, CC, PC; 4 = for portfolios with MP and all combinations of CA, CHMO, DC, CC, PC, ACH
Frequency of use	Number of payments made in a typical period (month) for each of the payment method categories, except for mobile payments
Personality Traits: Extroversion Agreeableness Conscientiousness Neuroticism Openness to Experience	1 – 50 score to measure the degree of each of the traits across consumers
Payment Attributes: Acceptance Cost Convenience Security Getting and setting up Payment records	1 – 5 score on a Likert scale of how consumers favor each payment method based on these attributes with 1 being least favorable and 5 being most favorable

Table 7 (Contd.)

Measures of Variables Included in the Study

Variables	Description and coding
Types of transactions:	
Automatic Bill Payment	The number of automatic bill payments made in a typical month.
Online Bill Payment	The number of online bill payments made in a typical month.
In-person Bill Payment (or via mail)	The number of in-person bill payments made in a typical month.
Online (non-bill) Payment	The number of online (non-bill) payments made in a typical month.
Retail Payments (made in-person)	The number of retail payments made in a typical month.
Age	Continuous measure
Gender	1 = female, 0 = male and other
Race	Dichotomous variables for White, Black, Asian, and other (Native American and Pacific Islander) and mixed races
Ethnicity	Dichotomous variable for belonging to Hispanic or Latino origin
Household Income	Dichotomous variables for <$25,000, $25,000 - $49,999, $50,000 - $74,999, $75,000 - $99,999, ≥ $100,000
Education	Dichotomous variables for less than high school, high school and some college experience, Bachelor's degree, and Advanced degree
Employment Status	Dichotomous variables for employed, unemployed, retired (including disabled)
Nationality	Dichotomous variables for U.S. born or foreign born
Census Region	Dichotomous variables for each of the U.S. census region – Northeast, Midwest, West, South
Financial Literacy Score	Consumers assessment based on 14 questions from National Financial Capability Study
Declared Bankruptcy	Dichotomous variable
Overdrawn Bank Account	During the past 12 months, did the respondent overdraw any of their bank accounts
Fraudulent Activity	Ever experienced a fraudulent activity, stolen or lost money on credit card, debit card, or checks

A Discrete Choice Model to Explain Payment Behavior

Discrete choice models depict choices among alternatives (Train, 2002). Discrete choice models are derived assuming that decision-makers seek to maximize utility. Such models have come to be known as random utility models where a decision-maker, I, must choose among J alternatives. The decision-maker obtains a level of utility from each alternative as shown by U_{ij}, j = 1, … , J. The decision-maker chooses an alternative that fetches them the highest utility. The decision-maker chooses alternative k if and only if $U_{ik} > U_{ij}$, $\forall\, k \neq j$.

Further, the utility obtained from an alternative is known to the decision-maker but not the researcher. The researcher does not observe the decision-maker's utility. The researcher observes some attributes of the alternatives as faced by the i^{th} decision-maker, denoted by z_{ijt} $\forall$ j, some attributes of the i^{th} decision-maker, denoted by s_i, and can specify a function that relates these observed factors to the decision-maker's utility. This function is popularly called representative utility, $V_{ij} = V(z_{ij}, s_i)$ $\forall$ j. Since the researcher does not observe aspects of the decision-maker's utility, $U_{ij} \neq V_{ij}$. Utility derived by individual I from alternative j can thus be represented as

$$U_{ij} = V_{ij} + \varepsilon_{ij} \qquad (1)$$

where ε_{ij} denotes the factors that affect U_{ij} but are not included in $V_{ij.}$ E_{ij} is defined based on the researcher's representation of the choice situation.

Such choice behaviors are estimated using logit models. The logit model assumes that ε_{ijt} is an independently and identically distributed extreme value having homogeneous error variance. This leads to the assumption of independence of irrelevant alternatives (IIA). This assumption implies that a consumer's preference for a payment portfolio at the adoption stage (or a payment method at the use stage) over another is independent of the availability of other

alternatives. The density and cumulative distribution of ε_{ijt} are given by equations 2 and 3, respectively:

$$f(\varepsilon_{ij}) = \exp(-\varepsilon_{ij}) \exp(-\exp(-\varepsilon_{ij})) \quad (2)$$

$$F(\varepsilon_{ij}) = \exp(-\exp(-\varepsilon_{ij})) \quad (3)$$

Under this assumption of IIA, the probability that decision-maker I chooses the jth payment portfolio or method over the kth payment portfolio is given by:

$$P_{ij} = \text{Prob}(U_{ij} > U_{ik}, \; j \neq k) \quad (4)$$

$$P_{ij} = \text{Prob}(V_{ij} + \varepsilon_{ij} > V_{ik} + \varepsilon_{ik}, \; \forall j \neq k) \quad (5)$$

$$P_{ij} = \frac{\exp(V_{ij})}{\sum_{k=1}^{J} \exp(V_{ik})} \quad (6)$$

Koulayev et al. (2016) and Trütsch (2016) built the behavioral model of payment choice based on the afore-mentioned random utility framework, but they did so using cross-sectional data. The current study is unique because it attempts to build a model depicting consumers' payment behavior using repeated observations from panel data. Rysman (2007) and Stavins (2016) are the few payment methods researchers who have conducted longitudinal analyses of payment choices. However, they have considered payment methods separately instead of as a portfolio of payment methods as in this research. This study performs a panel data analysis using data from 2015 rounds of SCPC through to the most recent wave of 2020 to examine the effect of personality traits on the adoption and usage of payment methods.

Adoption of a Payment Portfolio Belonging to One of the Four Categories

The first stage in the econometric model or the adoption stage comprises consumers choosing their portfolios from n = 1, …, N payment portfolio bundles consisting of cash, checks and money orders, debit cards, credit cards, prepaid cards, ACH payment methods, and contactless mobile payment methods. The consumer can adopt any combination of payment

methods in their portfolio. The consumer selects portfolio Pi ∈ P, where Pi is the payment method, and P is the set of all possible portfolios of payment instruments. Mathematically, each consumer can carry one from P = 27 = 128 combinations of payment methods making up a portfolio. Respondents chose from 82 payment portfolios in each wave of the panel data considered for the study (see Appendix A, Table A.1). For example, a consumer's portfolio may include cash and cards (debit, credit, and prepaid) but none of the mobile payment methods. Since consumers are heterogeneous in their adoption patterns and generally adopt several different payment methods instead of exclusively one instrument, it makes sense to proceed by determining the observed individual payment portfolios. To avoid having a multinomial logit model with many categories, the 82 payment portfolios were grouped into four categories as listed in Table 6. Equation 7 specifies a utility function to estimate the effect of personality traits on portfolio adoption is a sum of the observed utility function and the error term.

$$\text{Utility}_{ij} = V\left(\text{Big Five}_{ij}, \text{Demog}_{ij}, \text{PayAtt}_{ij}\right) + \varepsilon_{ij} \quad (7)$$

The observed utility is a function of $V(.)$ from adopting a particular portfolio, P_i from one of the four categories, at wave t depends on the Big Five personality traits, Big Five_{ij}, the aggregate measure on consumer assessment of the portfolio of payment methods adopted by them, PayAtt_{ij}, demographic characteristics of consumers, Demog_{ij}, year dummies, year_{ij}, and finally, the unobserved error component, ε_{ij}, related to the particular payment bundle but is assumed to be independently and identically distributed.

$$\text{Utility}_{ij} = \alpha + \eta_j \text{Big Five}_{ij} + \gamma_j \text{Demog}_{ij} + \beta_j \text{PayAtt}_{ij} + \lambda_j \text{year}_{ij} + \varepsilon_{ij} \quad (8)$$

This study begins by estimating the adoption of payment portfolios using a pooled multinomial logit model as shown by regression equation 8. Endogeneity issues might enter the payment portfolio adoption model due to omitted variables or unobserved factors that have not

been considered. This is minimized mainly by capturing consumers' perceptions and preferences about payment methods, such as assessing payment methods on various grounds (Jonker, 2007; Schuh & Stavins, 2010). At the adoption stage, the IIA assumption is assumed to hold as it is less likely that choosing a particular payment portfolio is dependent on whether there is an option to choose another portfolio (Trütsch, 2016).

$$\text{Utility}_{ijt} = \alpha_{ij} + \eta_j \text{Big Five}_{ijt} + \gamma_j \text{Demog}_{ijt} + \beta_j \text{PayAtt}_{ijt} + \varepsilon_{ijt} \quad (9)$$

Since the sample population is a dataset with repeated measures, the adoption of payment methods forming payment portfolios is then estimated using a random effects multinomial logit model for panel data. The random effects specification relaxes the assumption that multiple observations within a choice are independent, i.e., the IIA assumption. With this model, the choice probabilities for repeated choices made by respondent I share the same time-invariant unobserved heterogeneity α_{ij}, where the individual-specific effects act as a random variable that produces a correlation among the residuals for the same respondent within choices but leaves the residuals independent across all respondents in the population. Therefore, the utility of picking a payment portfolio j belonging to any of the four categories at time t in a random effects context can be specified in equation 9.

Use of Payment Methods from the Payment Portfolio

The first stage of the analysis is to choose one of the four categories of payment portfolios. The second stage comprises estimating a regression equation conditional on the adoption of the payment portfolio for each payment instrument separately. A payment opportunity is presented exogenously and allows a consumer to purchase or pay a bill using a payment method. The regression model at the second stage or the use stage is estimated separately for different transactions. Trütsch (2016) distinguished between retail payments and

service payments while estimating the model at the usage stage. However, the study was exclusive to payments made physically at POS. Since this study incorporates all kinds of payment methods available, it differentiates the type of transactions into in-person payments and online payments. For each type of transaction in the second stage, the consumer selects which payment method to use from their payment portfolio. Consumer I can choose among five payment instruments j = 1, ..., J such as cash, check, credit card, debit card, prepaid card, or ACH transfers to pay when faced with either transaction types such as in-person payments and online payments. The explanatory variables in equation 10 are the same as the adoption stage.

$$\text{Utility}_{ijt} = \alpha_{ij} + \eta_j \text{Big Five}_{ijt} + \gamma_j \text{Demog}_{ijt} + \beta_j \text{PayAtt}_{ij} + \varepsilon_{ijt} \qquad (10)$$

Equation 10 is first analyzed using a pooled multinomial logit model and then using a random effects multinomial logit model for panel data. Accordingly, observed heterogeneity across individuals in the model is accounted for. Moreover, the marginal utility of payment method j for a specific type of transaction is different across consumers. The adoption decision of available payment methods is not used at the second stage, and hence every consumer, irrespective of the number of adopted payment methods, is considered.

This chapter describes the econometric model of payment behavior explained as payment portfolio adoption in the first stage and then payment method usage in the second stage. The above equations are to be empirically tested to examine the influence of personality traits on consumers' payment behavior. Chapter 4 discusses the regression results of the adoption and use stage.

CHAPTER 4

RESULTS

This chapter begins with discussing the exploratory trend analysis of the popular payment portfolios held by consumers from 2015 to 2020. Next, the summary statistics of all the variables used in the study are provided. As described above, the econometric model for the analysis proceeds in two stages. In the first stage, the consumer picks which payment methods to adopt and forms their portfolio. In the next stage, the consumer decides which adopted payment method to use from their portfolio when faced with different payment opportunities. These two stages are modeled independently and sequentially. Later in the chapter, the results from the econometric analyses are discussed.

Payment portfolios held by the SCPC respondents

Table 8 shows the adoption rates of the ten most popular payment portfolios over time (2015-2020). The most popular bundle is held by about 18% of the population. It includes cash, checks/money orders, debit cards, credit cards, ACH transfers and is missing prepaid cards and contactless mobile payment methods. The second most popular payment portfolio includes all of the payment methods in the most popular portfolio with the addition of prepaid cards. As described in Table 1, prepaid cards store or record a dollar value. They may be issued by companies like Visa, MasterCard, or American Express but are not credit or debit cards. Some cards are for specific payment types, while others, issued by NetSpend or Green Dot, work for many kinds of payment. Prepaid cards could also be government-issued. The SCPC groups all of these different types of prepaid cards into one payment method.

Table 8

Payment Portfolio Adoption Rates from 2015 – 2020

No.	Payment Portfolios, P_i (CA, CHMO, DC, CC, PC, ACH, MP) †	2015	2016	2017	2018	2019	2020	χ^2
1	CA, CHMO, DC, CC, PC, ACH	21.95%	20.90%	17.68%	17.88%	15.90%	15.28%	60.42***
2	CA, CHMO, DC, CC, ACH	17.02%	18.49%	16.49%	16.47%	18.71%	15.76%	26.41***
3	CA, CHMO, DC, CC, PC, ACH, MP	11.11%	7.70%	11.77%	13.94%	11.52%	14.62%	62.78***
4	CA, CHMO, DC, CC, ACH, MP	5.33%	5.70%	5.78%	6.37%	7.04%	6.50%	23.22***
5	CA, CHMO, DC, PC, ACH	3.96%	3.84%	3.01%	2.81%	2.24%	2.90%	17.66***
6	CA, CHMO, CC, ACH	2.97%	3.89%	2.59%	2.72%	3.29%	2.16%	9.61*
7	CA, DC, CC, ACH	1.75%	3.12%	3.33%	3.08%	2.84%	3.20%	6.84
8	CA, CHMO, CC, PC, ACH	3.84%	2.62%	2.77%	2.95%	2.84%	2.39%	5.61
9	CA, CHMO, DC, ACH	3.59%	3.69%	2.91%	2.55%	2.32%	1.76%	12.95**
10	CA	5.29%	2.33%	2.71%	2.16%	2.34%	2.59%	24.65***
N		1,425	3,400	3,097	3,111	2,995	1,360	

Note. Ten most popular payment portfolios that are considered in the analyses. X^2 statistics are reported to identify significantly different adoption rates across the waves. *** p<0.01, ** p<0.05, * p<0.1

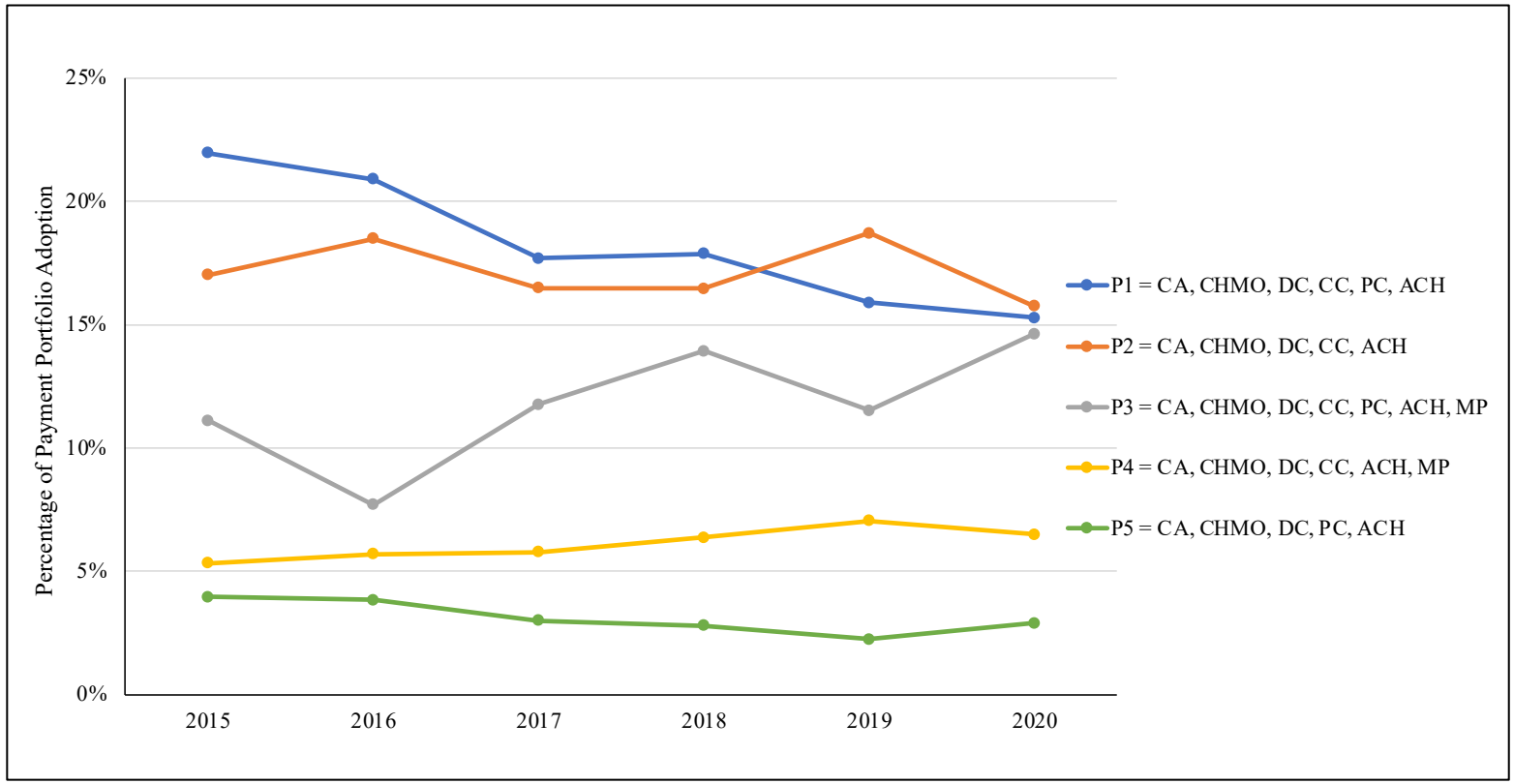
† CA denotes Cash, CHMO denotes Check and Money Order, DC is Debit Card, CC is Credit Card, PC is Prepaid Card, ACH consists of BANP (Bank Account Number Payments) and OBBP (Online Banking Bill Payments) transfers, and MP denotes Contactless Mobile Payments.

Further, Figures 4 and 5 plot the percentage of consumers adopting these ten payment portfolios over time (first five in Figure 4 and the next five in Figure 5). Starting with Figure 4, P_1 (CA, CHMO, DC, CC, PC, ACH) and P_2 (CA, CHMO, DC, CC, ACH) are the most common payment portfolios held by consumers. The payment portfolios P_1 and P_2, showing decreased adoption in the last two years, are devoid of contactless mobile payments, a mode of payment that has gained popularity in recent years. The payment portfolio that shows a steady increase across the waves 2015 – 2020 is P_3 (CA, CHMO, DC, CC, PC, ACH, MP). P3 consists of all of the payment methods. Similarly, the adoption of P_4 (CA, CHMO, DC, CC, ACH, MP) is seen to be consistently on the rise with a 4% increase in 2020 following the onset of the COVID-19 pandemic, perhaps because as mobile payments are considered to be the cleaner alternative for making transactions.

P3 and P4 correspond to P2 and P1, respectively, except for the mobile payments present in the former. The rising adoption rates of these two payment portfolios show that consumers prefer payment portfolios that include contactless mobile payment methods in addition to existing payment methods. Next, in Figure 5, all payment portfolios have much lower adoption rates than in Figure 4. The payment portfolios have an overall decreasing trend except for two payment portfolios, P7 (CA, DC, CC, ACH) and P10 (CA). P10 includes only cash and indicates that cash as a payment method is not decreasing in popularity despite the rising accessibility of contactless payment methods. P3 and P4 are considered the most technologically advanced portfolios. Although nine of the ten portfolios are fairly diverse by definition in Chapter 2, the most diverse are P3 and P4. The least diverse portfolio of these ten is P10, including only one payment method. To avoid conducting econometric analyses with many categories, the portfolios were grouped into four categories, as discussed in Chapter 3.

Figure 4

First Five of the Top 10 Payment Portfolios from 2015 through 2020 (N = 15,388)

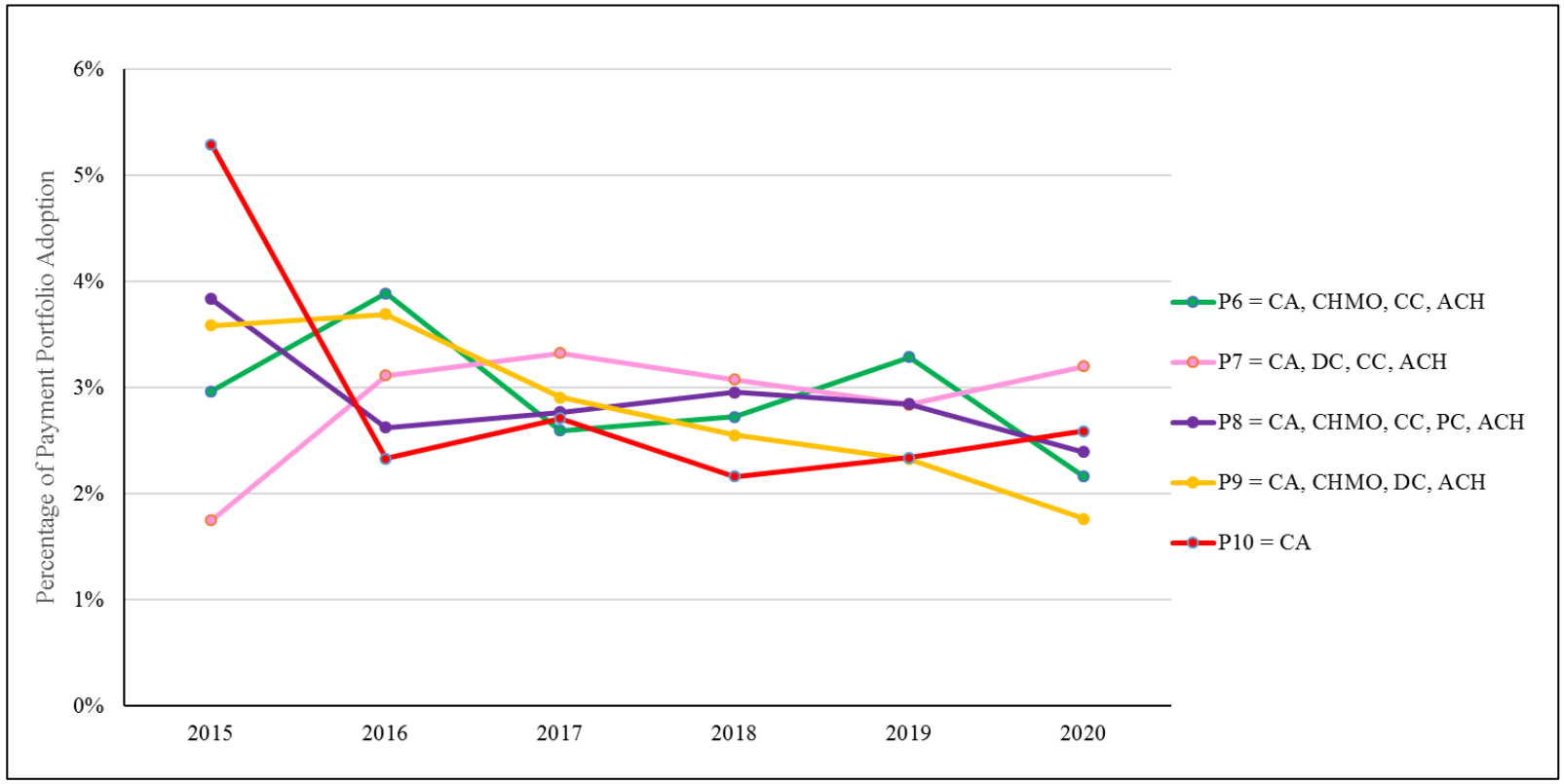


Note. Weighted percentage adoption of payment portfolios over time are plotted.

† CA denotes Cash, CHMO denotes Check and Money Order, DC is Debit Card, CC is Credit Card, PC is Prepaid Card, ACH consists of BANP (Bank Account Number Payments) and OBBP (Online Banking Bill Payments) transfers, and MP denotes Contactless Mobile Payments.

Figure 5

Next Five of the Top 10 Payment Portfolios from 2015 through 2020 (N = 15,388)



Note. Weighted percentage adoption of payment portfolios over time are plotted.

† CA denotes Cash, CHMO denotes Check and Money Order, DC is Debit Card, CC is Credit Card, PC is Prepaid Card, ACH consists of BANP (Bank Account Number Payments) and OBBP (Online Banking Bill Payments) transfers, and MP denotes Contactless Mobile Payments.

Descriptive Statistics

The summary statistics of the explanatory variables included in the econometric analyses are presented in Tables 9 to 12. The number of respondents for each variable may vary due to a small number of missing data, assumed to be missing at random. First, Table 9 shows the summary statistics of the Big Five personality traits for the panel dataset. See Appendix Table A.2 for a list of all the questions used to score respondents on Extroversion, Agreeableness, Conscientiousness, Neuroticism, and Openness to Experience. The mean scores for Agreeableness, Conscientiousness, and Openness to Experience were at around 36. Mean scores in Table 9 are comparable to the mean scores of the Big Five personality traits from the UAS1 survey.

Table 9

Summary Statistics of the Big Five Personality Traits (N = 4,545)

Variable	Mean	S.D.	Min	Max
Extraversion	26.58	6.335	8	40
Agreeableness	36.34	5.428	9	45
Conscientiousness	36.57	5.457	9	45
Neuroticism	21.34	6.606	8	40
Openness to Experience	36.29	6.281	11	50

Note. Weighted means presented for the panel dataset.

Next, Table 10 presents the mean ratings for the payment method-related attributes for the seven types of methods considered in the study. The SCPC asks participants how they evaluate payment methods across six characteristics on a scale of 1 to 5, with 5 being the most favorable score that can be assigned. Acceptance, cost, convenience, and getting and setting up

the payment method are the attributes for which cash was scored highly, with a mean score of around four or above out of 5. As expected, security associated with cash and the payment records available from using cash at the POS attain average scores of about 2.8 and 2.4, respectively. For checks and money orders, mean scores for acceptance and availability of payment records are 3.5 out of 5. Mean scores for all the attributes, acceptance, cost, convenience, getting and setting up, and availability of payment records from using debit cards are greater than 4 out of 5 except for security issues. Credit cards and debit cards obtained similar mean scores for the attributes except for the cost of credit cards and getting and setting up for which credit cards are admittedly less favorable than debit cards. ACH transfers, namely OBBP and BANP, obtained higher ratings for acceptance and payment records, followed by the other attributes with the lowest score obtained for convenience. Additionally, there are no data available for similar ratings of contactless mobile payments.

Table 10

Mean Ratings of Payment Methods across Six Attributes (N= 4,572)

	Security	Acceptance for payment	Cost	Convenience	Getting and setting up	Payment records
Cash	2.80	4.51	4.38	3.97	4.19	2.39
Checks and Money orders	3.21	3.55	2.77	3.11	3.39	3.61
Debit cards	3.04	4.52	4.07	4.34	4.01	4.25
Credit cards	3.25	4.59	3.02	4.38	3.79	4.37
Prepaid cards	2.90	4.01	3.53	3.54	3.54	2.97
ACH	3.18	4.03	3.60	2.95	3.56	4.21

Note. Weighted means presented for the panel data. Ratings for Contactless Mobile Payments based on the six attributes are not available in the SCPC.

Table 11 shows the percentage of the population using each of the payment methods most frequently to make in-person and online transactions in a month. Around 32% of the respondents use debit cards most frequently for in-person transactions, followed by credit cards, cash, checks and money orders, and prepaid cards. A tiny percentage of respondents make in-person transactions with bank account numbers but since this proportion is very small, it was eliminated from the analysis. Around 45% of the respondents use ACH transfers most frequently for their online transactions, followed by debit cards, credit cards, and prepaid cards. About 3.5% of the sample population use checks and money orders most frequently to pay for their online transactions. Only those respondents are included who made either in-person or online transactions. Further, respondents whose maximum number of transactions made with a payment method per month were not equal to transactions with other payment methods were included.

Table 11

Most Frequent Payment Method Used by Transaction

Payment methods used	In-person Transactions	Online Transactions
Cash (CA)	21.35%	-
Checks and Money orders (CHMO)	17.63%	3.52%
Debit Cards (DC)	32.53%	25.96%
Credit Cards (CC)	25.93%	21.42%
Prepaid Cards (PC)	2.56%	4.53%
ACH Transfers (ACH)*	-	44.57%
N	4,403	3,897

Note. Weighted percentages presented. Data are recorded for monthly in-person transactions.

*Frequency of using mobile payments are not recorded in the SCPC.

Table 12 summarizes the demographic characteristics of the sample population weighted by population weights available with the data. The sample population consists of around 47% male and 53% female respondents. The average age of the respondents is around 47 years. Seventy-seven percent of the respondents are White, followed by about 13% of the respondents who are Black. Around 2% of the respondents are Asian, and around 8% of the respondents belong to other races, including mixed races. Thirteen percent of the respondents are of Hispanic or Latino origin. Around 22% of the respondents have a household income less than $25,000. A similar proportion of the respondents have a household income between $25,000 and $50,000, and income exceeding $100,000. Less than 9% of respondents did not graduate high school. Almost 50% of the respondents graduated high school and have some college experience, followed by about 29% who have a bachelor's degree. Fourteen percent of the respondents have an advanced degree. As for employment status, over 60% of the respondents are employed, almost 8% are unemployed, and the remaining 32% are retired or disabled. Ninety two percent of the respondents were born in the United States. About 28% of respondents are from the southern region, followed by the Midwest, the Northeast, and the West.

Fourteen knowledge questions from the National Financial Capability Study were asked to record individuals' financial literacy. The average score of the respondents is about 9 out of 14. A little over 4% of the total sample population had filed for bankruptcy. Approximately 23% of the respondents had previously overdrawn any of their bank accounts. About 15% of the population had experienced any fraudulent activity or had money stolen from their checking accounts.

Table 12

Summary Statistics of Other Explanatory Variables

	N	Mean	S.D.	Min	Max
Age	4,461	47.18	16.060	17	98
Gender					
Male	4,467	47.42%	0.499	0	1
Female	4,467	52.58%	0.499	0	1
Race					
White	4,472	76.98%	0.421	0	1
Black	4,472	12.84%	0.335	0	1
Asian	4,472	2.36%	0.152	0	1
Other races and mixed races	4,472	7.81%	0.268	0	1
Ethnicity					
Hispanic/ Latino origin	4,467	13.34%	0.340	0	1
Household income					
Less than $25,000	4,472	21.90%	0.414	0	1
$25,000 - $50,000	4,472	22.49%	0.418	0	1
$50,000 - $75,000	4,472	18.81%	0.391	0	1
$75,000 - $100,000	4,472	15.22%	0.359	0	1
More than $100,000	4,472	21.58%	0.411	0	1
Education					
Less than high school degree	4,472	8.51%	0.279	0	1
High school graduate and some college experience	4,472	49.25%	0.500	0	1
Bachelor's degree	4,472	28.53%	0.452	0	1
Advanced degree	4,472	13.71%	0.344	0	1
Employment Status					
Employed	4,472	60.45%	0.489	0	1
Unemployed	4,472	7.79%	0.268	0	1
Retired or disabled	4,472	31.76%	0.466	0	1
Born in the United States	4,465	91.62%	0.277	0	1

Table 12 (Contd.)

Summary Statistics of Other Explanatory Variables

	N	Mean	S.D.	Min	Max
Northeast	4,472	12.43%	0.330	0	1
Midwest	4,472	17.44%	0.379	0	1
West	4,472	12.37%	0.329	0	1
South	4,472	27.74%	0.448	0	1
Financial Literacy Score	4,472	9.17	3.145	0	14
Declared bankruptcy	4,472	4.16%	0.200	0	1
Overdrawn bank account	4,251	22.74%	0.419	0	1
Experienced fraudulent activity	4,472	15.17%	0.359	0	1
2015	4,472	11.43%	0.318	0	1
2016	4,472	23.81%	0.426	0	1
2017	4,472	18.91%	0.392	0	1
2018	4,472	19.25%	0.394	0	1
2019	4,472	17.84%	0.383	0	1
2020	4,472	8.76%	0.283	0	1

Note. Weighted means presented.

Regression Results

Adoption of payment methods to form a payment portfolio

Pooled and random effects multinomial logit models are analyzed to examine the adoption of payment portfolios. The dependent variable comprises the four categories of payment portfolios from which individuals choose. It is regressed on the Big Five personality traits and control variables hierarchically. The base outcome is the first category comprising all combinations of portfolios containing CA, CHMO, and PC. The regression estimates are shown in Tables B.1 through B.6, Appendix B, and the marginal effects are shown in Tables 13 and 14.

The marginal effects computed at sample mean from Model I convey that being more extroverted, more conscientious, more neurotic, and more open to experiences significantly affect the likelihood of adopting portfolios in all categories. However, the adjusted R-squared for Model I in Table B.1 is extremely low (around 0.009). So, it would be more revealing to look at the influence of personality traits on payment portfolio adoption controlling for more relevant

Models II and III show that the probability of adopting a portfolio in the first (portfolios with all combinations of CA, CHMO, PC) and the second category (portfolios with DC, CC, and all combinations of CA, CHMO, PC) of portfolios increases by about 0.1% as a respondent's score on the Extroversion scale increases by one unit. Also, the probability of adopting a portfolio in the fourth category (MP and all combinations of CA, CHMO, DC, CC, PC, ACH) increases by 0.3% as a respondent's score on the Extroversion scale increases by one unit. However, the opposite holds for the third category (ACH and all combinations of CA, CHMO, DC, CC, PC). The probability of adopting a portfolio in the third category decreases by 0.4% as scores on the Extroversion scale increases by one unit. Extroverted respondents are more likely to adopt portfolios including both MP and ACH, among other methods, and are less likely to adopt those portfolios containing methods using only ACH transfers along with other methods.

The probability of choosing the third category of payment portfolios decreases by 0.3% as a respondent's score on the Openness to Experience scale increases by one unit. Conversely, the probability of adopting payment portfolios from the fourth category increases by about 0.3% in response to a unit increase in the score on the Openness to Experience scale. Like Extroversion, individuals who are open to new experiences are more likely to adopt portfolios including both MP and ACH, among other methods and are less likely to adopt those portfolios containing methods using only ACH transfers along with other methods.

Table 13

Marginal Effects in the Pooled Multinomial Logit Model on Portfolio Adoption

	Payment Portfolio Categories			
	1	2	3	4
Model I [a]				
Extroversion	0.001***	0.001***	-0.006***	0.004***
Agreeableness	0.000	-0.000	-0.000	0.000
Conscientiousness	-0.003***	0.000	0.006***	-0.003***
Neuroticism	0.001***	0.001	-0.003***	0.001**
Openness to Experience	0.000	-0.001***	-0.002***	0.003***
N	15,088			
Model II [a]				
Extroversion	0.001**	0.001**	-0.004***	0.003***
Agreeableness	0.001**	-0.001*	-0.001	0.001*
Conscientiousness	-0.001***	0.001*	0.004***	-0.003***
Neuroticism	0.000	0.001	-0.001	0.000
Openness to Experience	0.000	-0.000	-0.003***	0.003***
N	14,454			
Model III [a]				
Extroversion	0.001***	0.001*	-0.004***	0.003***
Agreeableness	0.001***	-0.001	-0.001	0.001
Conscientiousness	-0.001***	0.001**	0.003***	-0.003***
Neuroticism	0.000*	0.000	-0.001	0.000
Openness to Experience	0.000	-0.000	-0.003***	0.003***
N	14,129			

Note. *** p<0.01, ** p<0.05, * p<0.1

[a] Model I includes the Big Five personality traits as explanatory variables. Model II includes Big Five personality traits and the demographic characteristics. Model III includes Big Five personality traits, demographic characteristics, and the payment attributes.

† The 1st category comprises cash, checks and money orders, and prepaid cards. The 2nd category comprises debit cards or credit cards with the optional addition of methods in 1st category. The 3rd category consisting of ACH transfers with the optional addition of methods in 2nd category. Finally, all combinations of portfolios involving mobile payment methods makes the 4th category.

Furthermore, the probability of choosing the fourth category of portfolios (MP and all combinations of CA, CHMO, DC, CC, PC, ACH) decreases by 0.3%, with one unit increase in the Conscientiousness score. However, the probability of adopting a portfolio from the third category (ACH and all combinations of CA, CHMO, DC, CC, PC) increases by 0.4% with a unit increase in the Conscientiousness score. The marginal effects from Model III are similar to those of Model II. The year dummies included in the pooled multinomial logit model are statistically significant. To account for year effects, the above exercise is repeated using random effects multinomial logit models. The marginal effects at sample mean from the random effects multinomial logit models are akin to those of the pooled multinomial logit models.

Now turning to the explanatory variables in the models, the regression coefficients for demographic variables are in sync with previous literature on payment behavior (see Table B.2 and B.4). As a respondent ages, the multinomial log-odds for adopting payment portfolios in the second (DC and CC with combinations of CA, CHMO, PC) and third (ACH along with all combinations of CA, CHMO, DC, CC, PC) categories relative to portfolios in category one increases, everything else constant. Further, the multinomial log-odds for adopting portfolios in the fourth category (MP and all combinations of CA, CHMO, DC, CC, PC, ACH) decrease with age relative to those in category one, everything else fixed. As for the variation across races, if a respondent is Black versus non-Black, the odds for adopting any payment portfolios relative to portfolios in category one, decrease, everything else unchanged. For respondents earning less than $25,000 versus earning higher, the multinomial log-odds for adopting any payment portfolios relative to category one decrease, everything else unchanged. Similarly, the individuals who did not graduate high school versus their counterparts are less likely to adopt any portfolios relative to the portfolios in the first category.

Table 14

Marginal Effects in the Panel Multinomial Logit Model on Portfolio Adoption

	Payment Portfolio Categories †			
	1	2	3	4
Model I [a]				
Extroversion	0.001***	0.001***	-0.006***	0.004***
Agreeableness	0.000	0.000	0.000	0.001
Conscientiousness	-0.003***	0.000	0.006***	-0.003***
Neuroticism	0.001**	0.001	-0.003***	0.002*
Openness to Experience	0.000	-0.002***	-0.002**	0.004***
N	15,088			
Model II [a]				
Extroversion	0.001**	0.001**	-0.004***	0.003***
Agreeableness	0.001	-0.001	-0.002	0.002
Conscientiousness	-0.001***	0.001	0.004	-0.004***
Neuroticism	0.001	0.001	-0.001	0.001
Openness to Experience	0.000	0.000	-0.003***	0.003***
N	14,454			
Model III [a]				
Extroversion	0.001***	0.001*	-0.004***	0.003***
Agreeableness	0.001	-0.001	-0.002	0.002
Conscientiousness	-0.001***	0.001***	0.004***	-0.003**
Neuroticism	0.000*	0.000	-0.001	0.000
Openness to Experience	0.000	-0.000	-0.003*	0.003*
N	14,129			

Note. *** p<0.01, ** p<0.05, * p<0.1

[a] Model I includes the Big Five personality traits as explanatory variables. Model II includes Big Five personality traits and the demographic characteristics. Model III includes Big Five personality traits, demographic characteristics, and the payment attributes.

† The 1st category comprises cash, checks and money orders, and prepaid cards. The 2nd category comprises debit cards or credit cards with the optional addition of methods in 1st category. The 3rd category consisting of ACH transfers with the optional addition of methods in 2nd category. Finally, all combinations of portfolios involving mobile payment methods makes the 4th category.

Moreover, this result for Black individuals, the least educated, and earning the least income is more pronounced for the fourth category of portfolios (most technologically advanced portfolios, including MP) than for the other categories. Being more financially literate and experiencing fraudulent activities increases the likelihood of adopting payment portfolios belonging to the third and fourth groups of portfolios, that is, portfolios including ACH transfers and mobile payment methods.

Model III adds payment attributes in addition to demographic characteristics. The statistically significant results are listed below. The multinomial log-odds for adopting payment portfolios in the third and fourth categories relative to portfolios in the first category (all combinations of CA, CHMO, PC) decreases as cash becomes more favorable in terms of convenience, everything else fixed. The odds of adopting payment portfolios in all categories relative to portfolios in category one decrease as cash becomes more favorable based on the risk of using it, ceteris paribus. When scores increase in favor of the cost of checks, the odds of adopting any payment portfolio relative to portfolios in the first category will increase, holding everything else constant. However, even when the scores increase for money orders based on their cost and convenience, the odds of adopting portfolios in all categories relative to portfolios in the first category decreases.

When scores increase in favor of acceptance of credit cards, the odds of adopting payment portfolios in the third (ACH along with all combinations of other methods) or fourth (MP along with all combinations of all other methods) categories relative to those in the first category increase, everything else constant. The log-odds of adopting payment portfolios in the second (DC and CC with combinations of CA, CHMO, PC) and third categories relative to those in the first category increase as credit cards become more favorable in terms of their cost and in

terms of setting up, while holding everything else constant. As for ACH transfers, when OBBP gains in popularity based on the attributes such as risk and convenience, the odds of adopting the third and fourth category of portfolios increases. The availability of payment records does not affect the adoption of payment portfolios. The regression results of the influence of personality traits on the use of payment methods are discussed in the next section.

Use of Payment Methods from the Payment Portfolio

Pooled and random effects multinomial logit models are applied to analyze the influence of personality traits on the use of payments methods for making two types of transactions as described in the following sections.

In-person Transactions

A categorical variable recording the payment methods used most frequently for in-person transactions is regressed on the Big Five personality traits controlling for demographic variables (Model IV) and payment attributes (Model V). As in the adoption stage, random effects multinomial logit models are also estimated in addition to pooled models. The marginal effects for the Big Five personality traits from the pooled and the panel multinomial logit analyses are presented in Tables 15 and 16, respectively. Regression estimates, including all the control variables, are shown in Tables C.1 and C.2, Appendix C. The abbreviations for payment methods in Table 11 is used to describe the results.

The probability of using DC and PC most frequently falls by 0.1% on average as an individual's conscientiousness score increases by a unit. However, the likelihood of using CHMO most frequently increases by 0.3% as an individual's score on Conscientiousness increases by a unit. Further, the probability of using CHMO and CC most frequently increases by 0.1% on average as an individual's neuroticism score increases by a unit. In contrast, the

probability of using CA falls by 0.2% as an individual's neuroticism score increases by a unit. Agreeableness does not impact the use of payment methods for in-person transactions. The marginal effects of extroversion and openness to experiences are lost as the self-reported perceptions on select attributes of payment methods are added in Model V. The marginal effects from the pooled multinomial logit model agree with corresponding marginal effects from the random effects.

Cash is the base outcome for this model. The statistically significant regression estimates for other explanatory variables are listed below. As a respondent ages, the multinomial log-odds for using payment methods such as CHMO and CC for frequent in-person transactions increases relative to using cash, everything else constant. The odds of using other payment methods relative to cash are lower for men than women. As for the variation across races, the multinomial log-odds of using CHMO and CC most frequently relative to cash are less for Black individuals than non-Black respondents, holding all other variables constant. Additionally, if a respondent is of Hispanic or Latino origin, the multinomial log-odds of using CHMO and CC most frequently relative to cash decrease in comparison to their counterparts, holding all other variables constant. Furthermore, the multinomial log-odds of using CHMO and CC most frequently relative to cash is less for individuals earning less than $25,000 annually than for those who earn more, holding all other variables constant. Similarly, individuals who did not graduate high school versus their counterparts are less likely to use CHMO, DC, and CC frequently relative to cash. This holds even for individuals who graduated high school and have college education experience. However, those with at least a bachelor's degree are more likely to use credit cards frequently than cash for in-person transactions.

Table 15

Marginal Effects in the Pooled Multinomial Logit Model for In-person Transactions

	Payment Methods †				
	CA	CHMO	DC	CC	PC
Model IV [a]					
Extroversion	-0.001	-0.001	0.000	0.001*	0.000
Agreeableness	-0.001	-0.000	0.004***	-0.002**	-0.000
Conscientiousness	-0.002***	0.004***	-0.002**	0.001	-0.001***
Neuroticism	-0.002***	0.002**	-0.000	0.001*	-0.000
Openness to Experience	0.001	-0.000	0.001	-0.002**	0.000
N	11,261				
Model V [a]					
Extroversion	-0.001	-0.000	0.000	0.001	0.000
Agreeableness	-0.001	-0.000	0.002**	-0.001	-0.000
Conscientiousness	-0.001	0.003***	-0.001*	0.001	-0.001**
Neuroticism	-0.002***	0.002**	-0.001	0.001*	-0.000
Openness to Experience	0.000	-0.000	0.001	-0.001	0.000
N	11,008				

Note. *** p<0.01, ** p<0.05, * p<0.1

[a] Model IV includes Big Five personality traits and the demographic characteristics. Model V includes Big Five personality traits, demographic characteristics, and the payment attributes.

†CA denotes Cash, CHMO denotes Check and Money Order, DC is Debit Card, CC is Credit Card, PC is Prepaid Card.

Table 16

Marginal Effects in the Panel Multinomial Logit Model for In-person Transactions

	Payment Methods †				
	CA	CHMO	DC	CC	PC
Model IV [a]					
Extroversion	-0.001	-0.001	0.000	0.001*	0.000
Agreeableness	-0.001	-0.000	0.004***	-0.002**	-0.000
Conscientiousness	-0.002***	0.004***	-0.002**	0.001	-0.001***
Neuroticism	-0.002***	0.002**	-0.000	0.001*	-0.000
Openness to Experience	0.001	-0.000	0.001	-0.002**	0.000
N	11,261				
Model V [a]					
Extroversion	-0.001	-0.000	0.000	0.001	0.001
Agreeableness	-0.001	-0.000	0.002**	-0.001	-0.000
Conscientiousness	-0.001	0.003***	-0.001*	0.001	-0.001**
Neuroticism	-0.002***	0.002**	-0.000	0.001*	-0.000
Openness to Experience	0.001	-0.000	0.000	-0.001	0.000
N	11,008				

Note. *** p<0.01, ** p<0.05, * p<0.1

[a] Model IV includes Big Five personality traits and the demographic characteristics. Model V includes Big Five personality traits, demographic characteristics, and the payment attributes.

†CA denotes Cash, CHMO denotes Check and Money Order, DC is Debit Card, CC is Credit Card, PC is Prepaid Card.

Being more financially literate significantly increases the odds of individuals using CHMO and CC most frequently for in-person transactions relative to cash. The multinomial log-odds of using payment methods such as CC for in-person transactions relative to using cash decreases if an individual overdrew any of their bank accounts, everything else constant. However, the likelihood of using DC and CHMO increases relative to cash.

Now turning to the payment attributes, as respondents increasingly favor cash based on its convenience, the multinomial log-odds of using CHMO, DC, or CC for in-person transactions decrease relative to cash, everything else constant. A similar observation is made when cash is increasingly favored based on getting and setting up the payment method.

Next, if a respondent's ratings for all of the attributes regarding checks increase by one point, the multinomial log-odds of using CHMO for in-person transactions increase, holding everything else constant. Under the same conditions, the odds of using credit cards and debit cards also increase in a few cases. However, as respondents favor money orders based on their cost and convenience, the multinomial log-odds of using CHMO for in-person transactions decrease relative to cash, everything else constant. In the case of debit cards, as individuals rank attributes regarding debit cards favorably, the likelihood of using debit cards increases for in-person transactions, everything else being constant. Conversely, under the same conditions, the odds of using credit cards decreases in the case of a few attributes. Analogously, as individuals rank attributes concerning credit cards favorably, the likelihood of using credit cards increases but the odds of using debit cards decreases in the case of a few attributes, everything else being constant. When a respondent's ratings for all attributes increase regarding OBBP, the odds of using CHMO decrease, and the odds of using methods involving ACH transfers increase, everything else being constant.

Online Transactions

A categorical variable recording the payment methods used most frequently for online transactions is regressed on the Big Five personality traits controlling for demographic variables (Model VI) and additionally payment attributes (Model VII). As in the previous section, random effects multinomial logit analyses are also conducted to consider the panel nature of the data. The marginal effects for the Big Five personality traits from the pooled and the panel multinomial logit analyses are presented in Tables 17 and 18, respectively. Regression estimates for Model VII inclusive of control variables are shown in Appendix C, Tables C.3 and C.4.

The probability of using DC most frequently falls by 0.2% on average as an individual's score on the Conscientiousness scale increases by a unit. However, the probability of using ACH transfers increases by 0.3% as an individual's score on the Conscientiousness scale increases by a unit. The probability of using ACH most frequently decreases by 0.4% on average as an individual's score on the Openness to Experience scale increases by a unit. The probability of using CHMO most frequently decreases by 0.1% on average as an individual's score on the Openness to Experience scale increases by a unit. The probability of using DC and CC most frequently increases by 0.3% and 0.2% as an individual's Openness to Experience scale scores increase by a unit.

The marginal effects of Agreeableness, Neuroticism, and Extroversion are diminished as the payment attribute variables are added in Model VII. The marginal effects from the pooled multinomial logit model agree with corresponding marginal effects from the random effects. Other than the personality traits, the regression coefficients for demographic variables and payment attributes are presented for the pooled and random effects multinomial logit models in Tables C.3 and C.4, respectively. The base outcome is the ACH transfers.

Table 17

Marginal Effects in the Pooled Multinomial Logit Model for Online Transactions

	Payment Methods †				
	CHMO	DC	CC	PC	ACH
Model VI [a]					
Extroversion	0.001**	-0.000	-0.000	-0.001**	-0.001**
Agreeableness	0.000	-0.000	0.000	-0.000	0.000
Conscientiousness	-0.001	-0.003***	-0.001	0.002**	0.003***
Neuroticism	-0.000	-0.001	0.000	-0.003***	0.002**
Openness to Experience	0.000	0.003***	0.000	0.001	-0.005***
N	11,407				
Model VII [a]					
Extroversion	0.001*	-0.001	-0.000	0.000	0.000
Agreeableness	-0.001	0.001	-0.001	-0.000	0.001
Conscientiousness	-0.000	-0.002**	-0.001	0.000	0.003***
Neuroticism	-0.000	-0.001	0.000	0.000	0.001
Openness to Experience	-0.001**	0.003***	0.002***	0.000	-0.004***
N	11,170				

Note. *** p<0.01, ** p<0.05, * p<0.1

[a] Model VI includes Big Five personality traits and demographic characteristics. Model VII includes Big Five personality traits, demographic characteristics, and the payment attributes.

†CHMO denotes Check and Money Order, DC is Debit Card, CC is Credit Card, PC is Prepaid Card, ACH consists of BANP (Bank Account Number Payments) and OBBP (Online Banking Bill Payments) transfers.

As a respondent ages, the multinomial log-odds of using payment methods such as DC, CC, and PC to make online transactions relative to using ACH transfers decrease, everything else constant. In contrast, the multinomial log-odds of using CHMO to make online transactions relative to using ACH transfers increase with age, everything else constant. As for the variation across races, if a respondent is Black versus non-Black, the multinomial log-odds of using PC and DC for online transactions relative to ACH transfers increase, holding all other variables constant. For respondents earning less than $25,000 versus those earning higher income, the multinomial log-odds of using CHMO, PC, and DC most frequently relative to ACH transfers increase while holding all other variables in the model constant.

Similarly, individuals who did not graduate high school are more likely to use CHMO, PC, and DC relative to ACH compared to their counterparts, everything else unchanged. They are also significantly less likely to use credit cards relative to ACH. Holding everything else constant, all respondents relative to those who have an advanced degree are less likely to use credit cards most frequently for online transactions. Being more financially literate significantly increases the odds of individuals using CC for online transactions relative to ACH while decreasing the odds of using CHMO and DC. Having declared bankruptcy in the past significantly decreases the odds of using CC most frequently for online transactions relative to ACH, everything else unchanged.

As for the payment attributes, when a respondent's ratings for all the attributes regarding the use of DC increase by one point, the multinomial log-odds of using DC most frequently for online transactions increase, everything else constant. However, as the attributes such as cost, convenience, and the risk associated with using DC are increasingly favored, their likelihood of using CC most frequently for online transactions declines.

Table 18

Marginal Effects in the Panel Multinomial Logit Model for Online Transactions

	Payment Methods †				
	CHMO	DC	CC	PC	ACH
Model VI [a]					
Extroversion	0.001**	-0.000	-0.000	-0.001**	-0.001**
Agreeableness	0.000	-0.000	0.000	-0.000	0.000
Conscientiousness	-0.001	-0.003***	-0.001	0.002**	0.003***
Neuroticism	-0.000	-0.001	0.000	-0.003***	0.002**
Openness to Experience	0.000	0.003***	0.000	0.001	-0.005***
N	11,407				
Model VII [a]					
Extroversion	0.001*	-0.001	-0.000	0.000	0.000
Agreeableness	-0.001	0.001	-0.001	-0.000	0.001
Conscientiousness	-0.000	-0.002**	-0.001	0.000	0.003***
Neuroticism	-0.000	-0.001	0.000	0.000	0.001
Openness to Experience	-0.001**	0.003***	0.002***	0.000	-0.004***
N	11,170				

Note. *** p<0.01, ** p<0.05, * p<0.1

[a] Model VI includes Big Five personality traits and the demographic characteristics. Model VII includes Big Five personality traits, demographic characteristics, and the payment attributes.

† CHMO denotes Check and Money Order, DC is Debit Card, CC is Credit Card, PC is Prepaid Card, ACH consists of BANP (Bank Account Number Payments) and OBBP (Online Banking Bill Payments) transfers.

When a respondent's ratings for all attributes concerning credit cards increase, the multinomial log-odds of using CC most frequently increase, everything else constant. Additionally, respondents' likelihood of using DC and PC most frequently for online transactions takes a hit. Even in the case of ACH transfers such as BANP and OBBP, as respondents rank the attributes associated with BANP and OBBP favorably, their likelihood of using DC, CC, or PC most frequently for online transactions decreases. Notably, as respondents favor OBBP by rating the associated attributes highly, the likelihood of using CHMO for making online transactions takes a significant hit. This concludes the analysis at the use stage, examining the influence of personality traits on the frequent use of payment methods in the case of two types of transactions – in-person and online. The results described in this chapter are summarized in the section below.

Summary of Results

This chapter starts by describing the payment portfolios held by the respondents between 2015 and 2020. The sample population adopted 82 portfolios in total. An exploratory trend analysis was conducted using the top ten most popular portfolios out of the 82. The first portfolio contains cash, checks or money orders, debit, credit cards, prepaid cards, and ACH methods, while the second consists of the same methods except for prepaid cards. Both portfolios are devoid of contactless mobile payments and show decreased adoption in the last two years. However, the third most popular portfolio is similar to the most common portfolio with mobile payments as an additional method, while the fourth most common portfolio contains the same payment methods as the third portfolio but excludes prepaid debit cards. These two portfolios show a steady increase in the adoption rates during the study period. The adoption rate of the fourth most popular portfolio jumped by 4% in 2020 following the onset of the COVID-19

pandemic. P3 and P4 are considered the most technologically advanced portfolios. Although nine of the ten portfolios are fairly diverse by the definitions in Chapter 2, the most diverse are P3 and P4. The least diverse portfolio of these ten is P10, including only one payment method (cash).

For an easier interpretation of the multivariate analyses, the 82 portfolios were grouped into four categories reflecting increasing technological advancement. The first category primarily included paper-based payment methods, and the fourth category included all payment methods, including contactless mobile payments. The categorization indicates the level of technological advancement ranging from the first category comprising the oldest to the fourth category consisting of the latest innovations in the payment industry.

It was hypothesized that, except for Neuroticism, all personality traits are positively associated with holding a more technologically advanced portfolio. Although this hypothesis (H1) is rejected, the following results are noted. At the portfolio adoption stage, the results show that as individuals become more extroverted and open to experiences, they are more likely to adopt portfolios, including contactless mobile payments in addition to CA, CHMO, DC, CC, PC, and ACH. Moreover, results show that extroverted and open individuals are less likely to adopt portfolios lacking contactless mobile payments. Conscientiousness negatively influences the likelihood of adopting paper-based portfolios as well as the most technologically advanced portfolios including mobile payments. However, it positively influences the adoption of portfolios between these two extremes. Neuroticism and Agreeableness did not significantly impact one's payment portfolio adoption.

Further, it was also hypothesized that, except for Neuroticism and Conscientiousness, all personality traits are positively associated with holding a more diverse portfolio (H2). A direct conclusion cannot be reached regarding this hypothesis. Diverse portfolios are considered as

those that include at least one of the four types of payment methods, that is, paper, card, electronic, and contactless mobile payments. A portfolio is regarded as diverse it consists of cash, a debit card, ACH transfers, and mobile payments. The categorization of portfolios resulted in grouping together portfolios consisting of a larger number of payment methods as well as portfolios containing a small number of payment methods. Although Extroversion and Openness to Experience increase the likelihood of adopting portfolios in the fourth category, all portfolios in the fourth category are not diverse. They can also consist of a smaller number of payment methods. The information on the number of payment methods in each portfolio is lost due to the respondents only picking a category of payment portfolios and not a specific payment portfolio. Hence, H2 is inconclusive. This sums up the influence personality traits have on consumers' portfolio adoption.

With respect to the use of payment methods, 45% of the population completed their online transactions using ACH transfers followed by DC and CC. Thirty-two percent of the population made in-person transactions using DC, followed by CC and CA. It was hypothesized that except for Neuroticism, all personality traits are positively associated with using technologically advanced payment methods, that is, ACH transfers and mobile payment methods. H3 is rejected due to the following results. At the use stage, Conscientiousness and Neuroticism affect the likelihood of using payment methods for in-person transactions. Neuroticism positively influences the likelihood of using credit cards, checks, and money orders to make in-person transactions. Conscientiousness positively influences the use of checks and money orders for in-person transactions. Further, Conscientiousness and Openness to Experience affect the likelihood of using payment methods for online transactions. Conscientiousness positively influences the odds of using ACH transfers but negatively influences the odds of using

debit cards for online transactions. Openness to Experience positively influences the likelihood of using DC, CC, and CHMO but negatively influences the likelihood of using ACH transfers for online transactions. Agreeableness did not significantly impact one's use of payment methods for either type of transaction. This sums up the influence of personality traits on the use of payment methods.

Additionally, both portfolio adoption and payment method use are significantly explained by the demographic characteristics as expected. The self-reported assessments of attributes such as cost, convenience, the risk associated with the specific payment method, and the effort to set up the method significantly affect portfolio adoption. At the use stage, all attributes associated with debit cards, credit cards, and OBBP significantly influenced the use of the respective payment methods for both in-person and online transactions relative to the attributes of ACH.

CHAPTER 5

CONCLUSION

Personality traits have been linked to several financial traits and behaviors, yet payment behavior associated with personality traits has not been studied extensively. Most previous research focused on a single electronic payment method, particularly mobile payments, and applied technology acceptance models to understand adoption behavior. This study extends the current literature on determinants of payment behavior by closely examining the influence of personality traits on payment behavior. Moreover, prior literature has not considered that consumers carry several payment instruments to choose from at any given point of transaction.

This study is unique in two main ways. One, it is the first to examine the effect of personality traits on payment behavior considering the bundle of payment methods held by consumers, and two, it is the first to study payment portfolio adoption and use based on a panel data. This chapter presents a discussion of the findings, followed by the limitations of the study, and the implications for policy, practice, and scope for future research.

Discussion of the Findings

This study finds that 82 payment portfolios are held by respondents in a representative U.S. panel data available for 2015 to 2020. The top ten portfolios analyzed cover about 70% of the sample population. The most popular payment portfolio includes cash, checks, money orders, debit cards, credit cards, and ACH transfers but not mobile payments. However, two portfolios including mobile payments showed steady growth across these six years. The most diverse

portfolio comprising all seven payment methods showed a significant jump in its adoption rate in 2020. In April 2020, the number of customers registering for mobile banking rose 200% from 2019 (PYMNTS, 2020). Thus, this rise in adoption rates of portfolios including mobile payments is likely the outcome of the COVID-19 pandemic as mobile and online payments were deemed to be the cleaner modes of transactions.

While the effects are relatively small, personality traits are found to influence the adoption of different payment portfolios and, subsequently, the use of payment methods for in-person and online transactions. At the adoption stage, it was noted that extroverted respondents are more likely to adopt portfolios including mobile payments, ACH transfers, and other methods and are less likely to adopt portfolios containing ACH transfers with other methods excluding mobile payments. Similar results are obtained for the Openness to Experience trait. Costa and McCrae (1992) found that Extroversion and Openness to Experience are highly correlated, and additionally, both constructs are highly correlated with the Sensation Seeking construct. Zuckerman defined the Sensation Seeking (SS) personality trait as ". . .the need for varied, novel, and complex sensations and experiences and the willingness to take physical and social risks for the sake of such experience" (1979; p.10). The risk-seeking behavior indicated in the sensation-seeking trait may not be directly related to payment behavior but rather to the activities that these individuals indulge in. There is a clear indication that the extroverted, owing to their outgoing attitude and open individuals powered by their curiosity, are more likely to adopt portfolios involving technologically innovative forms of payment, including mobile payments. Khan et al. (2019) examined mobile payments and found that extroverted and young adults who are open to experiences are more likely to adopt mobile payments.

Analyzing the payment methods used for in-person transactions, it is noted that neuroticism positively affects the likelihood of using checks, money orders, and credit cards. At the same time, it negatively influences the likelihood of using cash for in-person transactions. Neurotic individuals are more likely to experience negative emotions, including anxiety, self-consciousness, irritability, emotional instability, and depression. Handling cash in-person to make transactions seems to be negatively associated with neuroticism. The opposite appears to hold for checks and money orders as well as credit cards. This could imply that neurotic individuals are more uncomfortable with less sensory methods such as electronic money and prefer the most tangible form of money, cash, which is the most sensory in nature. Interestingly, neuroticism was not observed to significantly impact the payment portfolio adoption, nor does it affect payment method selection for online transactions. Agreeableness as a personality trait also does not seem to influence payment behavior.

Openness to Experience negatively influences the likelihood of making payments with ACH transfers, including BANP and OBBP, or online transactions. Additionally, conscientiousness has repeatedly been associated with the use of check and money orders and negatively associated with the adoption and use of technologically advanced payment portfolios and payment methods. Conscientiousness is associated with individuals described as not high risk-takers, following conventions and rules, and aiming for competency and efficiency in their work (Maryland et al., 2008). Perhaps, conscientious individuals would rather make transactions with tried and tested methods than with newer payment methods, especially since money is being transferred between two entities during a transaction.

As for demographic characteristics and payment attributes, the results from this study are in sync with previous literature. Demographic characteristics and perceptions about several

attributes related to payment methods predict payment behavior greatly. Black individuals, individuals earning less than $25,000 annually, and those without a high school degree are less likely to adopt any of the payment portfolio or use any of the payment method than their counterparts; especially those that include mobile payments. At the adoption stage, cost convenience, risk associated, and the effort to set up the payment method play a significant role. This is intuitive as attributes such as acceptance and availability of payment records related to a payment method come into play once payment methods have already been adopted and are being used.

Limitations of the study

This study is not without limitations. First, data on personality traits are only recorded at one time point, hence they do not portray potential changes in personality traits over time. Roberts and Moczrek (2008) assert that personality traits continue to change even in old age. They may also change due to monumental incidents in one's life. It may be possible that the respondents in the sample population had undergone a significant change in their personality across these six years. However, this could not be accounted for in the study. Second, since there are 82 payment portfolios, analyzing multinomial logit models with many levels would be cumbersome. Therefore, four categories of payment portfolios were created. At the adoption stage, the respondents are examined based on the choice they make out of these four categories instead of examining individual portfolios. Consequently, some information is lost as the conclusions are made for a general category of similar portfolios instead of a specific payment portfolio. Another challenge was the unbalanced nature of the panel used in the study.

Although the SCPC is an extensive survey on payment methods, several other limitations arise from data availability. The SCPC does not ask its respondents to assess contactless mobile

payments characteristics. Thus, consumers' assessment of characteristics of the payment portfolios held does not include the evaluation of mobile payments. Additionally, the frequency of transactions made with mobile payments is also not available in the data. It must be noted that the SCPC does record if mobile payments were made using a debit card, credit card, or prepaid card, but it does not ask specific questions about adoption and frequency of use. Further, there was missing data for some of the variables resulting in uneven sample sizes across the analyses. The study did not account for banking status which influences access to certain instruments such checks and cards. In addition, perceptions about the financial system such as consumer trust and confidence in financial institutions were not available to be included (Apaam et al., 2018).

Despite the excitement and promises revolving around contactless payment technology, it failed to gain popularity in the U.S. compared to peer countries (Akana & Wu, 2020, Trütsch, 2020). By 2016, most card issuers had stopped distributing contactless chip cards, and only about 3% of cards in the U.S. market had the tap-and-pay feature (Hedges et al., 2017). However, because of the COVID-19 pandemic, contactless services including payments became more popular. By March 2020, contactless card transactions surpassed the transactions made with physical cards as in-person paper methods were viewed as less appealing at point of sale and remote payments also presented an additional safeguard for those avoiding being in the public (Foster et al., 2021; Mastercard, 2020). American Express, Bank of America, Visa, and other issuers ramped up their efforts to transition to contactless EMV cards to meet the enormous demand (McMillin, 2020). The SCPC, however, does not identify if a consumer swipes, inserts the chip (of a contact EMV card), or taps to pay (contactless EMV card).

Although the SCPC starts by differentiating types of prepaid cards, the survey later combines them to form a single variable, thus not allowing the distinction between reloadable

prepaid cards, transit prepaid cards, government benefit cards, and gift cards. Payments industry experts assert that consumers' payment behavior has changed permanently as these numbers have not returned to their pre-pandemic proportions (Global Payments, 2022). Thus, massive changes are taking place in the payment ecosystem, and these are occurring fast, which calls for the availability of more recent data. The fourth and final limitation is that data for 2021 are not available yet. It will be crucial to observe and analyze data for 2021 and 2022 to examine how payment behavior has changed and how permanent this change has been.

Policy Implications and Future Research

This study has several important implications for the payment industry and policymakers. The results from this study serve as motivations for the government to design and implement federal and state payment-related policies and tend to consumer well-being as well. All of the ten most popular payment portfolios listed as part of the exploratory analysis include cash and the tenth most popular portfolio includes only cash indicating that cash is not going out of "style" and will always be in use by consumers, even singularly so. It also informs policymakers about policies towards a cashless society as seen in the case of Sweden's legislative approach. Even with payment modernization, cash is still highly popular among consumers (Klein, 2020). Results from this study also inform the proposed Payment Choice Act of 2019, a bill introduced in Congress which makes it unlawful for a person selling goods or services at retail to refuse to accept cash for the goods or services, post signs or notices stating that cash payment is unaccepted or charge a higher price to a customer who pays by cash. Such policies should protect the consumers whose personality and other socioeconomic characteristics lend them to continue to favor cash over all other more technologically advanced payment instruments.

Another bill, the Touchless Transactions Act of 2020 which was introduced in March 2020, also provides protections for consumers initiating contactless

Psychologists and practitioners who use personality traits such as financial planners and advisors will benefit from the knowledge of their clients' personality traits and associated payment behavior. One of the results from this study suggests that with an increase in Extroversion and Openness to Experience, consumers are more likely to hold portfolios including mobile payments and are less likely to hold portfolios that exclude mobile payment methods. Bratko et al. (2013) and Shahjehan et al. (2012) found a significant association between impulsive buying and traits such as Extroversion and Openness to Experience. Fan et al. (2022) found that extroversion was negatively associated with perceived financial capability, defined as one's ability to make informed decisions when it comes to managing finances. Further, Chatwani (2021) found that when financially literate consumers are extroverted, they have a higher chance of mortgage delinquency. Finally, Asebedo et al. (2019) found a negative association between Openness to Experience and one's saving behavior. These call for the attention of consumer welfare advocates, financial advisors, and policymakers in identifying individuals prone to spending disorders and other detrimental financial behaviors. They should be advised to watch their expenses made by various payment methods, especially with mobile payments, primarily because of their high ease of use. With the results from this study, financial advisors, planners, or therapists can link these financial behaviors of their clients to their payment behavior using the knowledge of their personality traits. This may help discourage their clients from using specific payment methods.

Since Extroversion and Openness to Experience increase the likelihood of adopting portfolios, including mobile payments, payment services providers can use this insight to design

products or advertise, emphasizing these traits. On the other hand, predatory payment service providers may nudge consumers to use a particular service by advertising related facets of personality traits. Additionally, conscientious individuals prefer to use technologically less advanced portfolios that are well established and conventionally used. Since Conscientiousness portrays competency, striving towards efficiency, following rules, etc., mobile payments and other technologically advanced payment methods have a long way to attract conscientious consumers for security and efficiency associated with mobile payments. Moreover, Conscientiousness was found to be positively associated with perceived financial capability (Fan et al., 2022). It is also reported to positively influence savings behavior (Asebedo et al., 2019). Thus, the payment methods used by conscientious individuals may help them achieve their financial motivations.

Further, there is a substantial scope to improve and build on this research in the future. As the U.S. payment landscape modernizes and more consumers are socialized to use the different features of their payment cards, future research on payment portfolio adoption and use, including information on mobile payments and distinguishing between the different types of cards, is warranted. Future research should examine payment behavior associated with other relevant behavioral concepts such as mental accounting and framing, explaining spending behavior. Additional non-cognitive abilities such as emotional stability, social skills, as well as cognitive abilities such as numeracy should also be studied related to consumers' payment behavior. Further, SCPC's diary version of the survey, Diary of Consumer Payment Choice (DCPC), may reveal the amount spent in each transaction and the goods and services purchased. This could shed more light on the consumers' payment behavior by the type and size of transactions making a study more nuanced study. Finally, future research should consider conducting qualitative

surveys to better understand consumers' payment behavior at the POS.

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APPENDIX A

PAYMENT PORTFOLIOS, BIG FIVE PERSONALITY TRAIT QUESTIONS, AND SUMMARY STATISTICS

Table A.1

List of all Payment Portfolios held by Sample Population

No.	Payment Portfolios, P_i (CA, CHMO, DC, CC, PC, ACH, MP)	Percentage
1	CA, CHMO, DC, CC, PC, ACH	18.27
2	CA, CHMO, DC, CC, ACH	17.34
3	CA, CHMO, DC, CC, PC, ACH, MP	11.46
4	CA, CHMO, DC, CC, ACH, MP	6.15
5	CA, CHMO, DC, PC, ACH	3.08
6	CA, CHMO, CC, ACH	3.03
7	CA, DC, CC, ACH	2.97
8	CA, CHMO, CC, PC, ACH	2.86
9	CA, CHMO, DC, ACH	2.86
10	CA	2.68
11	CA, DC, CC, PC, ACH	1.90
12	CA, PC	1.66
13	CA, CHMO, DC, PC, ACH, MP	1.62
14	CA, CHMO, DC, CC	1.57
15	CA, CHMO, PC	1.52
16	CA, DC, CC, PC, ACH, MP	1.49
17	CA, DC, PC, ACH	1.47
18	CA, DC, ACH	1.28
19	CA, CHMO, DC, CC, PC	1.18
20	CA, DC, CC, ACH, MP	1.17

21	CA, CHMO, CC, PC	0.89
22	CA, CHMO	0.89

No.	Payment Portfolios, P_i (CA, CHMO, DC, CC, PC, ACH, MP)	Percentage
23	CA, CHMO, CC	0.86
24	CA, CHMO, CC, PC, ACH, MP	0.79
25	CA, CHMO, DC	0.77
26	CA, DC	0.72
27	CA, CHMO, DC, ACH, MP	0.67
28	CA, CC, ACH	0.67
29	CA, DC, PC, ACH, MP	0.62
30	CA, CHMO, DC, PC	0.60
31	CA, CC	0.52
32	CA, CHMO, CC, ACH, MP	0.49
33	CA, DC, CC	0.44
34	CA, DC, ACH, MP	0.39
35	CA, CHMO, PC, MP	0.37
36	CA, DC, PC	0.36
37	CA, CC, PC, ACH	0.36
38	CA, CC, PC	0.32
39	CA, CHMO, ACH	0.31
40	CA, CHMO, PC, ACH	0.28
41	CA, PC, MP	0.28
42	CA, DC, CC, PC	0.26
43	CA, PC, ACH	0.19
44	CA, CHMO, PC, ACH, MP	0.18
45	CHMO, DC, CC, ACH	0.18
46	CA, CC, ACH, MP	0.17
47	CA, CC, PC, MP	0.16
48	CA, ACH	0.15
49	CA, CC, PC, ACH, MP	0.13
50	CA, CHMO, DC, CC, MP	0.12
51	CA, CHMO, CC, MP	0.12
52	CA, CHMO, DC, PC, MP	0.12
53	CA, CHMO, CC, PC, MP	0.10

54	CA, CHMO, MP	0.10
55	CA, CHMO, DC, CC, PC, MP	0.09

No.	Payment Portfolios, P_i (CA, CHMO, DC, CC, PC, ACH, MP)	Percentage
56	CA, PC, ACH, MP	0.09
57	CA, DC, MP	0.08
58	CHMO, DC, CC, PC, ACH	0.08
59	CA, DC, PC, MP	0.07
60	CA, DC, CC, MP	0.07
61	CA, CHMO, DC, MP	0.06
62	CA, CC, MP	0.06
63	CA, CHMO, ACH, MP	0.05
64	CHMO, DC, CC, PC, ACH, MP	0.04
65	CA, MP	0.03
66	CHMO, CC, ACH	0.03
67	CA, DC, CC, PC, MP	0.03
68	CA, ACH, MP	0.02
69	CHMO, DC, CC	0.02
70	DC, ACH	0.02
71	DC, CC, PC, ACH	0.02
72	CHMO, DC, CC, ACH, MP	0.01
73	CHMO, DC, PC	0.01
74	CC, ACH	<0.01
75	PC, ACH	<0.01
76	CHMO, DC, CC, PC	<0.01
77	DC	<0.01
78	0	<0.01
79	CHMO, DC	<0.01
80	CHMO, DC, PC, ACH, MP	<0.01
81	CHMO, CC, PC, ACH, MP	<0.01
82	DC, CC, ACH	<0.01

Table A.2

Big Five Personality Traits Questions asked in the SCPC

Big Five Personality Traits Questions
1. Is talkative (E)
2. Tends to find fault with others (A)
3. Does a thorough job (C)
4. Is depressed, blue (N)
5. Is original, comes up with new ideas (O)
6. Is reserved (E)
7. Is helpful and unselfish with others (A)
8. Can be somewhat careless (C)
9. Is relaxed, handles stress well (N)
10. Is curious about many different things (O)
11. Is full of energy (E)
12. Starts quarrels with others (A)
13. Is a reliable worker (C)
14. Can be tense (N)
15. Is ingenious, a deep thinker (O)
16. Generates a lot of enthusiasm (E)
17. Has a forgiving nature (A)
18. Tends to be disorganized (C)
19. Worries a lot (N)
20. Has an active imagination (O)
21. Tends to be quiet (E)
22. Is generally trusting (A)
23. Tends to be lazy (C)
24. Is emotionally stable, not easily upset (N)
25. Is inventive (O)
26. Has an assertive personality (E)
27. Can be cold and aloof (A)
28. Perseveres until the task is finished (C)
29. Can be moody (N)
30. Values artistic, aesthetic experiences (O)
31. Is sometimes shy, inhibited (E)

Big Five Personality Traits Questions
32. Is considerate and kind to almost everyone (A)
33. Does things efficiently (C)
34. Remains calm in tense situations (N)
35. Prefers work that is routine (O)
36. Is outgoing, sociable (E)
37. Is sometimes rude to others (A)
38. Makes plans and follows through with them (C)
39. Gets nervous easily (N)
40. Likes to reflect, play with ideas (O)
41. Has few artistic interests (O)
42. Likes to cooperate with others (A)
43. Is easily distracted (C)
44. Is sophisticated in art, music, or literature (O)

Note. The total scores for each of the traits - E (Extroversion), A (Agreeableness), C (Conscientiousness), N (Neuroticism), and O (Openness to Experience) are calculated. From McCrae, R. R. (2004). Human nature and culture: A trait perspective. *Journal of Research in-personality*, 38, 3-14; McCrae, R. R., & Costa. P. T. Jr. (1999). A five-factor theory of personality. In L. A. Pervin, & O. P. John (Eds.), Handbook of personality: Theory and research. New York: Guilford Press

Table A.3

Summary Statistics of Sample Population with Repeated Measures

	N	Mean	S.D.	Min	Max
Demographic Variables					
Age	15,147	47.71	15.895	17	98
Gender					
Male	15,172	46.92%	0.499	0	1
Female	15,172	53.08%	0.499	0	1
Race					
White	15,187	77.05%	0.421	0	1
Black	15,187	12.93%	0.336	0	1
Asian	15,187	2.61%	0.160	0	1
Other races and mixed races	15,187	7.40%	0.262	0	1
Ethnicity					
Hispanic/ Latino origin	15,173	12.58%	0.332	0	1
Household Income					
Less than $25,000	15,187	21.76%	0.413	0	1
$25,000 - $50,000	15,187	22.72%	0.419	0	1
$50,000 - $75,000	15,187	18.76%	0.390	0	1
$75,000 - $100,000	15,187	15.77%	0.364	0	1
More than $100,000	15,187	20.99%	0.407	0	1
Education					
Less than high school degree	15,187	8.35%	0.277	0	1
High school graduate and some college experience	15,187	48.41%	0.500	0	1
Bachelor's degree	15,187	28.85%	0.453	0	1
Advanced degree	15,187	14.39%	0.351	0	1
Employment Status					
Employed	15,187	60.50%	0.489	0	1
Unemployed	15,187	7.58%	0.265	0	1
Retired	15,160	16.7%	0.373	0	1

Table A.3 (Contd.)

Summary Statistics of Sample Population with Repeated Measures

	N	Mean	S.D.	Min	Max
Born in the United States	15,169	91.77%	0.275	0	1
Census Region					
Northeast	15,187	11.43%	0.318	0	1
Midwest	15,187	16.53%	0.371	0	1
West	15,187	11.26%	0.316	0	1
South	15,187	26.53%	0.442	0	1
Year					
2015	15,187	9.49%	0.293	0	1
2016	15,187	21.73%	0.412	0	1
2017	15,187	20.31%	0.402	0	1
2018	15,187	20.22%	0.402	0	1
2019	15,187	19.44%	0.396	0	1
2020	15,187	8.80%	0.283	0	1
Financial Traits/Behavior					
Financial Literacy Score	15,187	9.22	3.145	0	14
Declared Bankruptcy	15,187	65.01%	0.477	0	1
Overdrawn bank account	14,574	21.22%	0.409	0	1
Fraudulent activity	15,187	14.44%	0.351	0	1

Note. Weighted percentages presented.

APPENDIX B

MULTINOMIAL LOGIT REGRESSION RESULTS – PORTFOLIO ADOPTION

Table B.1

Pooled Multinomial Logit Estimates – Portfolio Adoption (Model I)

	Payment Portfolio Categories †			
	1 (BO) [a]	2	3	4
Extroversion		-0.009	-0.031***	-0.007
		(0.008)	(0.007)	(0.007)
Agreeableness		-0.003	-0.002	-0.001
		(0.009)	(0.008)	(0.008)
Conscientiousness		0.069***	0.075***	0.055***
		(0.009)	(0.008)	(0.008)
Neuroticism		-0.012	-0.024***	-0.014**
		(0.008)	(0.007)	(0.007)
Openness to Experience		-0.018**	-0.004	0.012*
		(0.008)	(0.006)	(0.007)
Constant		-0.726	1.347***	-0.179
		(0.572)	(0.461)	(0.485)
N	15,088			
Pseudo R^2	0.009			

Note. Pooled multinomial logit regression coefficients are presented for the payment portfolio categories. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

† The 1st category ([a] Base Outcome, BO) comprises cash, checks and money orders, and prepaid cards. The 2nd category comprises debit cards or credit cards with the optional addition of methods in 1st category. The 3rd category consisting of ACH transfers with the optional addition of methods in 2nd category. Finally, all combinations of portfolios involving mobile payment methods makes the 4th category.

Table B.2

Pooled Multinomial Logit Estimates – Portfolio Adoption (Model II)

	Payment Portfolio Categories †		
	1 (BO) [a]	2	3	4
Extroversion		-0.012	-0.033***	-0.014
		(0.011)	(0.010)	(0.011)
Agreeableness		-0.036***	-0.027**	-0.018
		(0.013)	(0.012)	(0.012)
Conscientiousness		0.059***	0.054***	0.033***
		(0.013)	(0.012)	(0.012)
Neuroticism		-0.002	-0.011	-0.009
		(0.011)	(0.010)	(0.010)
Openness to Experience		-0.020*	-0.021**	-0.003
		(0.011)	(0.010)	(0.011)
Age		0.040***	0.030***	-0.010**
		(0.005)	(0.004)	(0.004)
Male [b]		0.171	-0.183	-0.330***
		(0.130)	(0.118)	(0.122)
Black [b]		-0.453***	-0.997***	-0.625***
		(0.168)	(0.150)	(0.157)
Asian		-0.490	-0.606	0.051
		(0.541)	(0.472)	(0.478)
Other race and mixed races		-0.379*	-0.640***	-0.501**
		(0.213)	(0.188)	(0.196)
Hispanic/ Latino origin		-0.010	-0.202	0.071
		(0.226)	(0.199)	(0.203)
Less than $25,000 [b]		-1.097***	-1.826***	-2.309***
		(0.323)	(0.304)	(0.307)
$25,000 - $50,000		-0.596*	-0.968***	-1.472***
		(0.326)	(0.308)	(0.311)
$50,000 - $75,000		-0.510	-0.580*	-1.013***
		(0.348)	(0.329)	(0.331)
$75,000 - $99,999		0.378	0.471	0.268
		(0.493)	(0.474)	(0.476)

Table B.2 (Contd.)

Pooled Multinomial Logit Estimates – Portfolio Adoption (Model II)

	Payment Portfolio Categories †		
	1 (BO) [a]	2	3	4
Less than high school [b] degree		-1.413***	-2.631***	-2.559***
		(0.470)	(0.450)	(0.457)
High school graduate and some college experience		-1.035**	-1.686***	-1.934***
		(0.444)	(0.427)	(0.429)
Bachelor's degree		-0.959**	-1.203***	-1.245***
		(0.449)	(0.432)	(0.434)
Employed [b]		0.177	0.256*	0.404***
		(0.156)	(0.142)	(0.146)
Unemployed		-0.593***	-0.676***	-0.708***
		(0.193)	(0.164)	(0.175)
Born in the U.S.		0.283	0.387	0.423*
		(0.272)	(0.243)	(0.249)
Northeast		0.121	-0.312	-0.507**
		(0.236)	(0.218)	(0.225)
Midwest		-0.223	-0.532***	-0.568***
		(0.181)	(0.163)	(0.167)
West		0.521*	0.156	0.232
		(0.270)	(0.250)	(0.254)
South		0.160	-0.210	-0.155
		(0.170)	(0.153)	(0.158)
Financial Literacy Score		-0.016	0.079***	0.117***
		(0.023)	(0.021)	(0.022)
Declared bankruptcy		-0.451	-0.449*	-0.039
		(0.294)	(0.257)	(0.265)
Overdrawn bank account		0.380**	0.969***	1.227***
		(0.177)	(0.159)	(0.162)
Experienced fraudulent activity		-0.026	0.305*	0.520***
		(0.198)	(0.176)	(0.179)

Table B.2 (Contd.)

Pooled Multinomial Logit Estimates – Portfolio Adoption (Model II)

	Payment Portfolio Categories †			
	1 (BO) [a]	2	3	4
2015 [b]		-1.513***	-1.786***	-2.631***
		(0.404)	(0.383)	(0.388)
2016		-1.498***	-1.628***	-2.540***
		(0.372)	(0.357)	(0.361)
2017		-1.409***	-1.490***	-1.773***
		(0.376)	(0.360)	(0.363)
2018		-1.384***	-1.415***	-1.643***
		(0.378)	(0.362)	(0.364)
2019		-0.095	-0.152	-0.399
		(0.421)	(0.407)	(0.409)
Constant		2.289**	5.809***	6.291***
		(1.056)	(0.975)	(0.999)
N	14,454			
Pseudo R^2	0.116			

Note. Pooled multinomial logit regression coefficients are presented. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

† The 1st category ([a] Base Outcome, BO) comprises cash, checks and money orders, and prepaid cards. The 2nd category comprises debit cards or credit cards with the optional addition of methods in 1st category. The 3rd category consisting of ACH transfers with the optional addition of methods in 2nd category. Finally, all combinations of portfolios involving mobile payment methods makes the 4th category.

[b] Female respondents, White respondents, income of more than $100,000, having an advanced degree (e.g., Masters or Doctorate degree), disabled and retired respondents and the year dummy for 2020 are the reference categories.

Table B.3

Pooled Multinomial Logit Estimates – Portfolio Adoption (Model III)

	Payment Portfolio Categories †		
	1 (BO) [a]	2	3	4
Extroversion		-0.022*	-0.041***	-0.022*
		(0.013)	(0.012)	(0.012)
Agreeableness		-0.039***	-0.034***	-0.027**
		(0.014)	(0.013)	(0.013)
Conscientiousness		0.057***	0.050***	0.032**
		(0.014)	(0.013)	(0.013)
Neuroticism		-0.012	-0.021*	-0.019*
		(0.012)	(0.011)	(0.011)
Openness to Experience		-0.021*	-0.019	-0.003
		(0.012)	(0.011)	(0.012)
Age		0.038***	0.037***	0.002
		(0.006)	(0.005)	(0.005)
Male [b]		0.170	-0.009	-0.154
		(0.139)	(0.128)	(0.132)
Black [b]		-0.057	-0.691***	-0.317*
		(0.191)	(0.174)	(0.182)
Asian		-0.301	-0.510	0.224
		(0.554)	(0.493)	(0.501)
Other race and mixed races		-0.272	-0.671***	-0.570***
		(0.229)	(0.206)	(0.214)
Hispanic/ Latino origin		-0.032	-0.190	0.087
		(0.239)	(0.213)	(0.219)
Less than $25,000 [b]		-0.763**	-1.286***	-1.790***
		(0.341)	(0.323)	(0.327)
$25,000 - $50,000		-0.433	-0.698**	-1.202***
		(0.340)	(0.323)	(0.326)
$50,000 - $75,000		-0.323	-0.392	-0.804**
		(0.364)	(0.346)	(0.349)
$75,000 - $99,999		0.349	0.514	0.302
		(0.503)	(0.484)	(0.486)

Table B.3 (Contd.)

Pooled Multinomial Logit Estimates – Portfolio Adoption (Model III)

	Payment Portfolio Categories †		
	1 (BO) [a]	2	3	4
Less than high school degree [b]		-0.881*	-2.059***	-1.967***
		(0.485)	(0.465)	(0.474)
High school graduate and some college experience		-0.682	-1.424***	-1.662***
		(0.454)	(0.437)	(0.440)
Bachelor's degree		-0.688	-0.987**	-1.036**
		(0.459)	(0.442)	(0.444)
Employed [b]		0.061	0.085	0.215
		(0.166)	(0.153)	(0.159)
Unemployed		-0.615***	-0.717***	-0.769***
		(0.205)	(0.180)	(0.192)
Born in the U.S.		0.538*	0.701***	0.762***
		(0.286)	(0.257)	(0.265)
Northeast		0.089	-0.310	-0.470*
		(0.252)	(0.235)	(0.242)
Midwest		-0.189	-0.537***	-0.541***
		(0.194)	(0.177)	(0.182)
West		0.534*	0.128	0.204
		(0.288)	(0.270)	(0.275)
South		0.197	-0.181	-0.100
		(0.181)	(0.166)	(0.171)
Financial Literacy Score		-0.054**	0.003	0.031
		(0.026)	(0.024)	(0.025)
Declared bankruptcy		-0.468	-0.520*	-0.140
		(0.316)	(0.279)	(0.289)
Overdrawn bank account		0.463**	0.993***	1.241***
		(0.188)	(0.171)	(0.174)
Experienced fraudulent activity		0.071	0.387**	0.604***
		(0.212)	(0.192)	(0.196)

Table B.3 (Contd.)

Pooled Multinomial Logit Estimates – Portfolio Adoption (Model III)

	Payment Portfolio Categories †		
	1 (BO) [a]	2	3	4
Cash - Acceptance		-0.019	-0.004	-0.046
		(0.081)	(0.075)	(0.077)
Cash - Cost		-0.111	-0.097	-0.068
		(0.078)	(0.071)	(0.074)
Cash - Convenience		-0.027	-0.160**	-0.209***
		(0.077)	(0.070)	(0.072)
Cash - Risk		-0.125**	-0.056	-0.101**
		(0.053)	(0.049)	(0.051)
Cash – Getting and setting up		0.091	0.055	0.068
		(0.079)	(0.072)	(0.074)
Cash – Payment records		-0.086	-0.075	-0.078
		(0.059)	(0.054)	(0.056)
Check - Acceptance		0.012	-0.030	-0.047
		(0.066)	(0.060)	(0.062)
Check - Cost		0.231***	0.146*	0.150*
		(0.082)	(0.075)	(0.077)
Check - Convenience		0.121	0.065	-0.055
		(0.074)	(0.068)	(0.070)
Check - Risk		0.193***	0.091	0.075
		(0.074)	(0.068)	(0.069)
Check – Getting and setting up		-0.010	-0.027	-0.130
		(0.090)	(0.083)	(0.085)
Check – Payment records		0.027	-0.079	-0.148*
		(0.092)	(0.083)	(0.086)
Money Order - Acceptance		-0.000	0.001	-0.026
		(0.061)	(0.056)	(0.058)
Money Order - Cost		-0.183**	-0.128*	-0.154**
		(0.076)	(0.071)	(0.073)
Money Order - Convenience		-0.069	-0.167**	-0.129*
		(0.074)	(0.068)	(0.071)
Money Order - Risk		0.012	0.022	0.094
		(0.069)	(0.063)	(0.064)
Money Order – Getting and setting up		-0.010	-0.198**	-0.193***
		(0.081)	(0.075)	(0.077)
Money Order – Payment records		-0.006	-0.088	-0.077
		(0.073)	(0.067)	(0.069)

Table B.3 (Contd.)

Pooled Multinomial Logit Estimates – Portfolio Adoption (Model III)

	Payment Portfolio Categories †			
	1 (BO) [a]	2	3	4
Debit Card - Acceptance		0.011	0.015	0.058
		(0.103)	(0.096)	(0.101)
Debit Card - Cost		0.003	0.070	0.067
		(0.080)	(0.073)	(0.076)
Debit Card - Convenience		0.023	0.117	0.171*
		(0.091)	(0.084)	(0.088)
Debit Card - Risk		-0.131	-0.123	-0.122
		(0.084)	(0.077)	(0.079)
Debit Card – Getting and setting up		0.091	0.278***	0.281***
		(0.098)	(0.090)	(0.094)
Debit Card – Payment records		0.145	0.264***	0.297***
		(0.101)	(0.095)	(0.098)
Credit Card - Acceptance		0.113	0.206**	0.173*
		(0.094)	(0.087)	(0.092)
Credit Card - Cost		0.154**	0.112*	0.094
		(0.061)	(0.057)	(0.058)
Credit Card - Convenience		0.059	0.047	0.045
		(0.084)	(0.076)	(0.080)
Credit Card - Risk		0.095	0.072	0.098
		(0.079)	(0.073)	(0.075)
Credit Card – Getting and setting up		0.135*	0.139**	0.097
		(0.075)	(0.068)	(0.070)
Credit Card – Payment records		-0.017	-0.014	-0.075
		(0.101)	(0.093)	(0.097)
Prepaid Card - Acceptance		-0.172**	-0.199***	-0.207***
		(0.079)	(0.073)	(0.076)
Prepaid Card - Cost		0.173**	0.069	0.046
		(0.074)	(0.067)	(0.069)
Prepaid Card - Convenience		0.074	0.040	0.055
		(0.078)	(0.072)	(0.074)
Prepaid Card - Risk		0.099	0.031	0.026
		(0.069)	(0.063)	(0.065)
Prepaid Card – Getting and setting up		0.079	-0.008	0.052
		(0.081)	(0.075)	(0.077)
Prepaid Card – Payment records		-0.173**	-0.185***	-0.193***
		(0.072)	(0.067)	(0.068)

Table B.3 (Contd.)

Pooled Multinomial Logit Estimates – Portfolio Adoption (Model III)

	Payment Portfolio Categories †			
	1 (BO) [a]	2	3	4
BANP - Acceptance		-0.025	-0.011	-0.011
		(0.058)	(0.054)	(0.055)
BANP - Cost		-0.174*	-0.071	-0.059
		(0.096)	(0.089)	(0.092)
BANP - Convenience		0.012	-0.021	-0.021
		(0.074)	(0.068)	(0.070)
BANP - Risk		-0.064	-0.054	-0.126*
		(0.075)	(0.068)	(0.070)
BANP – Getting and setting up		0.091	0.002	0.079
		(0.092)	(0.086)	(0.088)
BANP – Payment records		0.072	0.092	0.117
		(0.094)	(0.088)	(0.091)
OBBP - Acceptance		0.004	-0.003	0.024
		(0.063)	(0.058)	(0.060)
OBBP - Cost		0.068	0.128	0.118
		(0.095)	(0.087)	(0.091)
OBBP - Convenience		-0.079	0.161**	0.221***
		(0.075)	(0.070)	(0.072)
OBBP - Risk		-0.086	0.154**	0.253***
		(0.078)	(0.071)	(0.073)
OBBP – Getting and setting up			-0.177**	0.052
		(0.090)	(0.083)	(0.086)
OBBP – Payment records			-0.215**	0.032
		(0.096)	(0.091)	(0.095)
2015 [b]		-1.347***	-1.534***	-2.326***
		(0.418)	(0.400)	(0.406)
2016		-1.418***	-1.533***	-2.420***
		(0.382)	(0.368)	(0.373)

Table B.3 (Contd.)

Pooled Multinomial Logit Estimates – Portfolio Adoption (Model III)

	Payment Portfolio Categories †			
	1 (BO) [a]	2	3	4
2017		-1.376***	-1.405***	-1.670***
		(0.386)	(0.372)	(0.375)
2018		-1.341***	-1.372***	-1.559***
		(0.389)	(0.374)	(0.377)
2019		-0.093	-0.154	-0.396
		(0.434)	(0.420)	(0.423)
Constant		1.743	2.629**	2.620**
		(1.194)	(1.113)	(1.150)
N	14,129			
Pseudo R^2	0.168			

Note. Pooled multinomial logit regression coefficients are presented. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

† The 1st category ([a] Base Outcome, BO) comprises cash, checks and money orders, and prepaid cards. The 2nd category comprises debit cards or credit cards with the optional addition of methods in 1st category. The 3rd category consisting of ACH transfers with the optional addition of methods in 2nd category. Finally, all combinations of portfolios involving mobile payment methods makes the 4th category.

[b] Female respondents, White respondents, income of more than $100,000, having an advanced degree (e.g., Masters or Doctorate degree), disabled and retired respondents and the year dummy for 2020 are the reference categories.

Table B.4

Random Effects Multinomial Logit Estimates – Portfolio Adoption (Model I)

	Payment Portfolio Categories †			
	1 (BO) [a]	2	3	4
Extroversion		-0.001	-0.046***	0.001
		(0.014)	(0.010)	(0.011)
Agreeableness		-0.002	-0.002	0.003
		(0.016)	(0.012)	(0.013)
Conscientiousness		0.075***	0.095***	0.051***
		(0.016)	(0.012)	(0.013)
Neuroticism		-0.006	-0.031***	-0.010
		(0.014)	(0.010)	(0.011)
Openness to Experience		-0.034**	-0.010	0.024**
		(0.014)	(0.010)	(0.011)
Constant		-2.158**	2.101***	-1.066
		(0.987)	(0.703)	(0.761)
var(u2)	6.615***			
	(0.715)			
var(u3)	3.907***			
	(0.263)			
var(u4)	4.300***			
	(0.323)			
N	15,088			
Number of Groups	4,520			

Note. Random effects multinomial logit regression coefficients are presented for the payment portfolio categories. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

† The 1st category ([a] Base Outcome, BO) comprises cash, checks and money orders, and prepaid cards. The 2nd category comprises debit cards or credit cards with the optional addition of methods in 1st category. The 3rd category consisting of ACH transfers with the optional addition of methods in 2nd category. Finally, all combinations of portfolios involving mobile payment methods makes the 4th category.

Table B.5

Random Effects Multinomial Logit Estimates – Portfolio Adoption (Model II)

	Payment Portfolio Categories †		
	1 (BO) [a]	2	3	4
Extroversion		-0.008	-0.044***	-0.014
		(0.017)	(0.013)	(0.013)
Agreeableness		-0.043**	-0.029**	-0.012
		(0.020)	(0.014)	(0.015)
Conscientiousness		0.073***	0.066***	0.030**
		(0.019)	(0.014)	(0.015)
Neuroticism		0.007	-0.009	-0.002
		(0.017)	(0.012)	(0.013)
Openness to Experience		-0.025	-0.025**	0.004
		(0.017)	(0.012)	(0.013)
Age		0.061***	0.041***	-0.018***
		(0.007)	(0.005)	(0.006)
Male [b]		0.413**	-0.221	-0.447***
		(0.197)	(0.144)	(0.153)
Black [b]		-0.290	-1.157***	-0.427**
		(0.281)	(0.195)	(0.208)
Asian		-0.464	-0.886	0.157
		(0.810)	(0.568)	(0.584)
Other race and mixed races		-0.277	-0.819***	-0.576**
		(0.335)	(0.235)	(0.251)
Hispanic/ Latino origin		0.028	-0.158	0.208
		(0.354)	(0.248)	(0.258)
Less than $25,000 [b]		-0.477	-1.836***	-2.510***
		(0.414)	(0.331)	(0.340)
$25,000 - $50,000		-0.145	-0.809**	-1.548***
		(0.407)	(0.334)	(0.340)
$50,000 - $75,000		-0.192	-0.406	-1.113***
		(0.429)	(0.355)	(0.361)
$75,000 - $99,999		0.518	0.699	0.340
		(0.584)	(0.512)	(0.515)

Table B.5 (Contd.)

Random Effects Multinomial Logit Estimates – Portfolio Adoption (Model II)

	Payment Portfolio Categories †			
	1 (BO) [a]	2	3	4
Less than high school degree [b]		-0.899	-3.006***	-2.872***
		(0.602)	(0.510)	(0.525)
High school graduate and some college experience		-0.854	-1.788***	-2.196***
		(0.534)	(0.473)	(0.478)
Bachelor's Degree		-0.962*	-1.271***	-1.373***
		(0.539)	(0.478)	(0.482)
Employed [b]		0.202	0.264	0.529***
		(0.230)	(0.170)	(0.180)
Unemployed		-0.389	-0.805***	-0.779***
		(0.322)	(0.214)	(0.234)
Born in the U.S.		0.373	0.414	0.416
		(0.424)	(0.299)	(0.313)
Northeast		0.372	-0.223	-0.273
		(0.334)	(0.253)	(0.267)
Midwest		-0.016	-0.397**	-0.135
		(0.261)	(0.188)	(0.197)
West		0.799**	0.263	0.632**
		(0.374)	(0.289)	(0.299)
South		0.486**	-0.170	0.156
		(0.244)	(0.177)	(0.187)
Financial Literacy Score		-0.085**	0.086***	0.140***
		(0.036)	(0.026)	(0.028)
Declared bankruptcy		-0.567	-0.542*	-0.372
		(0.381)	(0.291)	(0.306)
Overdrawn bank account		0.192	0.890***	1.052***
		(0.214)	(0.173)	(0.177)
Experienced fraudulent activity		0.073	0.412**	0.637***
		(0.232)	(0.192)	(0.196)

Table B.5 (Contd.)

Random Effects Multinomial Logit Estimates – Portfolio Adoption (Model II)

	Payment Portfolio Categories †			
	1 (BO) [a]	2	3	4
Constant		-2.122	4.278***	4.053***
		(1.478)	(1.093)	(1.146)
var(u2)	6.345***			
	(0.701)			
var(u3)	1.932***			
	(0.197)			
var(u4)	2.319***			
	(0.232)			
N	14,454			
Number of Groups	4,520			

Note. Random effects multinomial logit regression coefficients are presented for the payment portfolio categories. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

† The 1st category ([a] Base Outcome, BO) comprises cash, checks and money orders, and prepaid cards. The 2nd category comprises debit cards or credit cards with the optional addition of methods in 1st category. The 3rd category consisting of ACH transfers with the optional addition of methods in 2nd category. Finally, all combinations of portfolios involving mobile payment methods makes the 4th category.

[b] Female respondents, White respondents, income of more than $100,000, having an advanced degree (e.g., Masters or Doctorate degree), disabled and retired respondents and the year dummy for 2020 are the reference categories.

Table B.6

Random Effects Multinomial Logit Estimates – Portfolio Adoption (Model III)

	Payment Portfolio Categories †		
	1 (BO) [a]	2	3	4
Extroversion		-0.020	-0.052***	-0.024*
		(0.016)	(0.014)	(0.014)
Agreeableness		-0.041**	-0.033**	-0.019
		(0.019)	(0.015)	(0.016)
Conscientiousness		0.071***	0.062***	0.031*
		(0.019)	(0.015)	(0.016)
Neuroticism		-0.005	-0.018	-0.013
		(0.016)	(0.013)	(0.014)
Openness to Experience		-0.025	-0.025*	0.002
		(0.016)	(0.013)	(0.014)
Age		0.054***	0.048***	-0.005
		(0.007)	(0.006)	(0.006)
Male [b]		0.336*	-0.007	-0.212
		(0.188)	(0.153)	(0.161)
Black [b]		0.019	-0.820***	-0.119
		(0.271)	(0.215)	(0.228)
Asian		-0.415	-0.864	0.235
		(0.755)	(0.587)	(0.602)
Other race and mixed races		-0.197	-0.780***	-0.607**
		(0.316)	(0.247)	(0.263)
Hispanic/ Latino origin		-0.027	-0.182	0.187
		(0.333)	(0.257)	(0.268)
Less than $25,000 [b]		-0.227	-1.195***	-1.830***
		(0.406)	(0.348)	(0.357)
$25,000 - $50,000		-0.005	-0.458	-1.148***
		(0.397)	(0.346)	(0.353)
$50,000 - $75,000		0.048	-0.132	-0.781**
		(0.423)	(0.371)	(0.377)
$75,000 - $99,999		0.659	0.863*	0.518
		(0.576)	(0.524)	(0.528)

Table B.6 (Contd.)

Random Effects Multinomial Logit Estimates – Portfolio Adoption (Model III)

	Payment Portfolio Categories †		
	1 (BO) [a]	2	3	4
Less than high school degree [b]		-0.541	-2.368***	-2.154***
		(0.585)	(0.524)	(0.539)
High school graduate and		-0.606	-1.540***	-1.896***
some college experience		(0.525)	(0.482)	(0.487)
Bachelor's degree		-0.724	(0.482)	(0.487)
		(0.530)	-1.064**	-1.147**
Employed [b]		0.144	(0.486)	(0.490)
		(0.221)	0.093	0.317*
Unemployed		-0.419	(0.181)	(0.191)
		(0.297)	-0.845***	-0.829***
Born in the U.S.		0.587	(0.225)	(0.244)
		(0.398)	0.690**	0.758**
Northeast		0.142	(0.311)	(0.326)
		(0.320)	-0.331	-0.343
Midwest		-0.081	(0.265)	(0.280)
		(0.250)	-0.445**	-0.173
West		0.720**	(0.200)	(0.210)
		(0.362)	0.198	0.544*
South		0.407*	(0.305)	(0.314)
		(0.233)	-0.182	0.154
Financial Literacy Score		-0.097***	(0.188)	(0.197)
		(0.035)	0.005	0.043
Declared bankruptcy		-0.561	(0.029)	(0.030)
		(0.388)	-0.656**	-0.471
Overdrawn bank account		0.337	(0.312)	(0.328)
		(0.219)	0.937***	1.100***
Experienced fraudulent activity		(0.219)	(0.186)	(0.191)
		0.227	0.518**	0.770***
		(0.244)	(0.210)	(0.214)

Table B.6 (Contd.)

Random Effects Multinomial Logit Estimates – Portfolio Adoption (Model III)

	Payment Portfolio Categories †			
	1 (BO) [a]	2	3	4
Cash - Acceptance		-0.053	-0.010	-0.064
		(0.093)	(0.082)	(0.084)
Cash - Cost		-0.102	-0.102	-0.058
		(0.092)	(0.079)	(0.082)
Cash - Convenience		-0.012	-0.158**	-0.201**
		(0.088)	(0.077)	(0.079)
Cash - Risk		-0.111*	-0.058	-0.118**
		(0.062)	(0.054)	(0.056)
Cash – Getting and setting up		0.046	0.066	0.054
		(0.091)	(0.079)	(0.081)
Cash – Payment records		-0.105	-0.094	-0.137**
		(0.070)	(0.060)	(0.063)
Check - Acceptance		0.024	-0.041	-0.060
		(0.078)	(0.067)	(0.070)
Check - Cost		0.314***	0.144*	0.163*
		(0.098)	(0.083)	(0.086)
Check - Convenience		0.078	0.057	-0.067
		(0.087)	(0.075)	(0.078)
Check - Risk		0.220**	0.074	0.090
		(0.087)	(0.075)	(0.077)
Check – Getting and setting up		0.028	-0.024	-0.152
		(0.106)	(0.091)	(0.094)
Check – Payment records		-0.032	-0.083	-0.156
		(0.109)	(0.093)	(0.096)
Money Order - Acceptance		-0.020	-0.012	-0.054
		(0.072)	(0.062)	(0.065)
Money Order - Cost		-0.293***	-0.127	-0.155*
		(0.089)	(0.078)	(0.080)
Money Order - Convenience		-0.037	-0.165**	-0.113
		(0.087)	(0.076)	(0.079)
Money Order - Risk		-0.010	0.003	0.073
		(0.080)	(0.069)	(0.071)
Money Order – Getting and setting up		-0.160*	-0.179**	-0.207**
		(0.094)	(0.082)	(0.085)
Money Order – Payment records		0.054	-0.066	-0.012
		(0.085)	(0.074)	(0.076)

Table B.6 (Contd.)

Random Effects Multinomial Logit Estimates – Portfolio Adoption (Model III)

	Payment Portfolio Categories †			
	1 (BO) [a]	2	3	4
Debit Card - Acceptance		0.031	0.044	0.058
		(0.122)	(0.107)	(0.113)
Debit Card - Cost		-0.070	0.075	0.073
		(0.094)	(0.082)	(0.085)
Debit Card - Convenience		0.017	0.147	0.198**
		(0.108)	(0.095)	(0.100)
Debit Card - Risk		-0.117	-0.098	-0.123
		(0.099)	(0.086)	(0.089)
Debit Card – Getting and setting up		0.281**	0.230**	0.407***
		(0.116)	(0.100)	(0.105)
Debit Card – Payment records		0.112	0.208**	0.251**
		(0.119)	(0.105)	(0.110)
Credit Card - Acceptance		0.137	0.227**	0.214**
		(0.114)	(0.098)	(0.105)
Credit Card - Cost		0.167**	0.121*	0.115*
		(0.071)	(0.062)	(0.064)
Credit Card - Convenience		0.070	0.060	0.042
		(0.100)	(0.086)	(0.091)
Credit Card - Risk		0.113	0.089	0.126
		(0.094)	(0.082)	(0.085)
Credit Card – Getting and setting up		0.092	0.134*	0.122
		(0.090)	(0.076)	(0.079)
Credit Card – Payment records		-0.012	-0.001	-0.046
		(0.119)	(0.104)	(0.110)
Prepaid Card - Acceptance		-0.181**	-0.204**	-0.189**
		(0.091)	(0.080)	(0.083)
Prepaid Card - Cost		0.215**	0.083	0.066
		(0.087)	(0.074)	(0.076)
Prepaid Card - Convenience		0.086	0.034	0.031
		(0.090)	(0.079)	(0.081)
Prepaid Card - Risk		0.126	0.049	0.049
		(0.080)	(0.070)	(0.072)
Prepaid Card – Getting and setting up		0.063	-0.009	0.030
		(0.095)	(0.082)	(0.085)
Prepaid Card – Payment records		-0.167**	-0.187**	-0.200***
		(0.084)	(0.073)	(0.075)

Table B.6 (Contd.)

Random Effects Multinomial Logit Estimates – Portfolio Adoption (Model III)

	Payment Portfolio Categories †			
	1 (BO) [a]	2	3	4
BANP - Acceptance		-0.033	-0.015	0.008
		(0.069)	(0.059)	(0.062)
BANP - Cost		-0.098	-0.070	-0.011
		(0.112)	(0.098)	(0.102)
BANP - Convenience		0.026	-0.012	-0.018
		(0.087)	(0.075)	(0.077)
BANP - Risk		-0.081	-0.068	-0.142*
		(0.088)	(0.076)	(0.078)
BANP – Getting and setting up		-0.030	0.068	0.041
		(0.106)	(0.093)	(0.096)
BANP – Payment records		0.100	0.074	0.080
		(0.110)	(0.097)	(0.101)
OBBP - Acceptance		0.013	-0.008	0.020
		(0.074)	(0.064)	(0.067)
OBBP - Cost		-0.005	0.128	0.080
		(0.111)	(0.097)	(0.102)
OBBP - Convenience		-0.157*	0.129*	0.205**
		(0.089)	(0.077)	(0.080)
OBBP - Risk		-0.109	0.149*	0.266***
		(0.091)	(0.079)	(0.081)
OBBP – Getting and setting up		-0.119	0.132	0.153
		(0.103)	(0.091)	(0.094)
OBBP – Payment records		-0.186*	0.087	0.181*
		(0.112)	(0.100)	(0.106)

Table B.6 (Contd.)

Random Effects Multinomial Logit Estimates – Portfolio Adoption (Model III)

	Payment Portfolio Categories †			
	1 (BO) [a]	2	3	4
Constant		-1.819	0.776	-0.120
		(1.498)	(1.229)	(1.293)
var(u2)	3.786***			
	(0.460)			
var(u3)	1.693***			
	(0.195)			
var(u4)	1.983***			
	(0.224)			
N	14,129			
Number of Groups	4,385			

Note. Random effects multinomial logit regression coefficients are presented for the payment portfolio categories. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

† The 1st category ([a] Base Outcome, BO) comprises cash, checks and money orders, and prepaid cards. The 2nd category comprises debit cards or credit cards with the optional addition of methods in 1st category. The 3rd category consisting of ACH transfers with the optional addition of methods in 2nd category. Finally, all combinations of portfolios involving mobile payment methods makes the 4th category.

[b] Female respondents, White respondents, income of more than $100,000, having an advanced degree (e.g., Masters or Doctorate degree), disabled and retired respondents and the year dummy for 2020 are the reference categories.

APPENDIX C

MULTINOMIAL LOGIT REGRESSION RESULTS – USE OF PAYMENT METHODS

Table C.1

Pooled Multinomial Logit Estimates – Use of Payment Methods (In-person)

	Payment Methods †				
	CA (BO) [a]	CHMO	DC	CC	PC
Extroversion		0.003	0.005	0.009	0.022*
		(0.006)	(0.005)	(0.006)	(0.012)
Agreeableness		0.006	0.014**	0.002	-0.010
		(0.007)	(0.007)	(0.007)	(0.016)
Conscientiousness		0.023***	0.002	0.012*	-0.027*
		(0.007)	(0.006)	(0.007)	(0.016)
Neuroticism		0.022***	0.010*	0.021***	0.010
		(0.006)	(0.006)	(0.006)	(0.013)
Openness to Experience		-0.003	0.001	-0.006	0.004
		(0.006)	(0.005)	(0.006)	(0.013)
Age		0.021***	0.002	0.015***	-0.009
		(0.003)	(0.003)	(0.003)	(0.006)
Male [b]		-0.140**	-0.230***	-0.127*	-0.265*
		(0.071)	(0.065)	(0.072)	(0.159)
Black [b]		-0.568***	-0.114	-0.451***	-0.374
		(0.132)	(0.103)	(0.137)	(0.265)
Asian		-0.100	-0.418	0.201	0.253
		(0.309)	(0.286)	(0.262)	(0.618)
Other race and mixed races		-0.376***	-0.204*	-0.527***	0.290
		(0.139)	(0.120)	(0.144)	(0.255)
Hispanic/ Latino origin		-0.431***	0.077	-0.340**	-0.408
		(0.152)	(0.114)	(0.148)	(0.290)
Less than $25,000 [b]		-0.434***	-0.184	-0.640***	-0.043
		(0.123)	(0.116)	(0.125)	(0.243)
$25,000 - $50,000		-0.123	0.251**	-0.389***	-0.277
		(0.110)	(0.105)	(0.110)	(0.243)
$50,000 - $75,000		-0.084	0.155	-0.165	-0.361
		(0.110)	(0.106)	(0.107)	(0.265)
$75,000 - $99,999		-0.072	0.233**	-0.085	-0.184
		(0.122)	(0.117)	(0.117)	(0.310)

Table C.1 (Contd.)

Pooled Multinomial Logit Estimates – Use of Payment Methods (In-person)

	Payment Methods †				
	CA (BO) [a]	CHMO	DC	CC	PC
Less than high school degree [b]		-0.490**	-0.455***	-1.577***	0.251
		(0.191)	(0.167)	(0.249)	(0.404)
High school graduate and some college experience		-0.184	-0.194*	-0.662***	0.248
		(0.113)	(0.107)	(0.109)	(0.307)
Bachelor's Degree		0.121	-0.048	-0.281***	0.586*
		(0.109)	(0.104)	(0.103)	(0.303)
Employed [b]		0.209**	0.073	-0.084	0.020
		(0.083)	(0.076)	(0.084)	(0.185)
Unemployed		-0.221	-0.150	-0.301*	0.055
		(0.150)	(0.124)	(0.153)	(0.253)
Born in the U.S.		0.251	0.279*	-0.201	0.077
		(0.171)	(0.149)	(0.156)	(0.346)
Northeast		0.031	-0.297***	-0.158	-0.201
		(0.116)	(0.110)	(0.117)	(0.272)
Midwest		0.001	-0.156*	-0.211**	-0.159
		(0.093)	(0.086)	(0.093)	(0.205)
West		-0.124	-0.194	0.103	-0.050
		(0.134)	(0.120)	(0.125)	(0.258)
South		-0.017	0.027	-0.137	-0.106
		(0.095)	(0.084)	(0.096)	(0.196)
Financial Literacy Score		0.026*	0.002	0.080***	0.034
		(0.014)	(0.013)	(0.015)	(0.030)
Declared bankruptcy		-0.228	0.131	-0.331	0.502
		(0.183)	(0.153)	(0.206)	(0.330)
Overdrawn bank account		0.163**	0.432***	-0.219**	-0.109
		(0.082)	(0.072)	(0.090)	(0.175)
Experienced fraudulent activity		-0.053	-0.202**	0.007	-0.044
		(0.096)	(0.086)	(0.095)	(0.198)

Table C.1 (Contd.)

Pooled Multinomial Logit Estimates – Use of Payment Methods (In-person)

	Payment Methods †				
	CA (BO) [a]	CHMO	DC	CC	PC
Cash - Acceptance		0.025	-0.001	0.041	-0.154*
		(0.043)	(0.038)	(0.043)	(0.081)
Cash - Cost		-0.023	-0.066	-0.058	0.011
		(0.046)	(0.041)	(0.047)	(0.098)
Cash - Convenience		-0.177***	-0.261***	-0.248***	-0.064
		(0.038)	(0.034)	(0.037)	(0.083)
Cash - Risk		-0.006	-0.014	0.008	-0.007
		(0.027)	(0.024)	(0.027)	(0.056)
Cash – Getting and setting up		-0.101**	-0.142***	-0.097**	-0.197**
		(0.042)	(0.038)	(0.042)	(0.084)
Cash – Payment records		-0.027	-0.008	-0.053	-0.065
		(0.031)	(0.028)	(0.032)	(0.069)
Check - Acceptance		-0.025	-0.075**	-0.044	-0.068
		(0.036)	(0.032)	(0.037)	(0.071)
Check - Cost		0.032	0.048	0.131***	-0.002
		(0.045)	(0.040)	(0.047)	(0.090)
Check - Convenience		0.308***	0.098***	0.030	-0.082
		(0.039)	(0.034)	(0.039)	(0.077)
Check - Risk		0.092**	-0.029	-0.003	-0.044
		(0.037)	(0.034)	(0.038)	(0.083)
Check – Getting and setting up		0.170***	0.077*	0.088*	0.074
		(0.048)	(0.042)	(0.048)	(0.104)
Check – Payment records		0.158***	-0.016	-0.076	-0.061
		(0.050)	(0.042)	(0.047)	(0.100)
Money Order - Acceptance		0.057*	0.015	0.054	0.120*
		(0.032)	(0.030)	(0.033)	(0.065)
Money Order - Cost		-0.097**	0.007	-0.089**	-0.035
		(0.038)	(0.035)	(0.038)	(0.079)
Money Order - Convenience		-0.107***	-0.108***	-0.061	-0.117
		(0.039)	(0.036)	(0.041)	(0.076)
Money Order - Risk		0.044	-0.012	-0.018	-0.150**
		(0.035)	(0.032)	(0.035)	(0.069)
Money Order - Getting and setting up		-0.025	-0.028	-0.064	0.001
		(0.040)	(0.037)	(0.042)	(0.085)
Money Order – Payment records		-0.046	-0.055*	-0.070**	0.060
		(0.034)	(0.031)	(0.034)	(0.073)

Table C.1 (Contd.)

Pooled Multinomial Logit Estimates – Use of Payment Methods (In-person)

	Payment Methods †				
	CA (BO) [a]	CHMO	DC	CC	PC
Debit Card - Acceptance		-0.032	0.204***	-0.081	0.158
		(0.063)	(0.059)	(0.063)	(0.139)
Debit Card - Cost		0.071	0.149***	-0.072	-0.073
		(0.046)	(0.043)	(0.049)	(0.105)
Debit Card - Convenience		0.053	0.436***	-0.276***	-0.031
		(0.056)	(0.054)	(0.056)	(0.112)
Debit Card - Risk		-0.042	0.066*	-0.187***	0.070
		(0.042)	(0.038)	(0.041)	(0.095)
Debit Card – Getting and setting up		-0.058	0.087*	-0.044	0.084
		(0.057)	(0.051)	(0.059)	(0.120)
Debit Card – Payment records		-0.076	0.250***	-0.054	0.000
		(0.053)	(0.052)	(0.054)	(0.128)
Credit Card - Acceptance		0.113*	0.068	0.079	-0.069
		(0.065)	(0.055)	(0.069)	(0.121)
Credit Card - Cost		0.048*	-0.045*	0.219***	-0.023
		(0.028)	(0.025)	(0.028)	(0.060)
Credit Card - Convenience		0.070	-0.071	0.442***	-0.117
		(0.055)	(0.046)	(0.060)	(0.104)
Credit Card - Risk		-0.002	-0.077**	0.138***	-0.088
		(0.040)	(0.036)	(0.039)	(0.087)
Credit Card – Getting and setting up		0.132***	0.081**	0.223***	-0.127
		(0.045)	(0.038)	(0.047)	(0.087)
Credit Card – Payment records		0.031	-0.111**	0.312***	-0.056
		(0.059)	(0.053)	(0.065)	(0.127)
Prepaid Card - Acceptance		0.025	-0.043	0.048	0.099
		(0.041)	(0.037)	(0.042)	(0.098)
Prepaid Card - Cost		-0.065*	-0.037	0.026	-0.081
		(0.038)	(0.034)	(0.039)	(0.078)
Prepaid Card - Convenience		-0.032	-0.034	0.024	0.277***
		(0.038)	(0.034)	(0.039)	(0.095)
Prepaid Card - Risk		0.001	0.049	0.030	0.127*
		(0.034)	(0.031)	(0.034)	(0.074)
Prepaid Card – Getting and setting up		-0.007	-0.047	-0.058	0.334***
		(0.043)	(0.038)	(0.044)	(0.096)
Prepaid Card – Payment records		-0.048	-0.060*	-0.048	0.162**
		(0.035)	(0.031)	(0.034)	(0.080)

Table C.1 (Contd.)

Pooled Multinomial Logit Estimates – Use of Payment Methods (In-person)

	Payment Methods †				
	CA (BO) [a]	CHMO	DC	CC	PC
BANP - Acceptance		0.039	-0.007	-0.002	0.044
		(0.032)	(0.029)	(0.032)	(0.070)
BANP - Cost		-0.023	0.023	-0.079	0.113
		(0.053)	(0.048)	(0.054)	(0.115)
BANP - Convenience		-0.008	-0.003	0.005	0.042
		(0.036)	(0.033)	(0.037)	(0.074)
BANP - Risk		0.068*	0.057*	0.093**	0.074
		(0.037)	(0.033)	(0.037)	(0.072)
BANP – Getting and setting up		-0.074	-0.000	-0.007	-0.035
		(0.048)	(0.043)	(0.049)	(0.095)
BANP – Payment records		-0.016	-0.013	-0.018	-0.069
		(0.050)	(0.045)	(0.051)	(0.105)
OBBP - Acceptance		-0.064*	-0.013	-0.074**	-0.068
		(0.035)	(0.031)	(0.035)	(0.069)
OBBP - Cost		0.039	-0.008	0.056	0.034
		(0.054)	(0.050)	(0.056)	(0.112)
OBBP - Convenience		-0.110***	0.024	0.106**	-0.015
		(0.040)	(0.038)	(0.043)	(0.081)
OBBP - Risk		-0.081**	-0.007	0.006	-0.085
		(0.039)	(0.035)	(0.039)	(0.077)
OBBP – Getting and setting up		-0.094**	0.030	-0.008	-0.065
		(0.047)	(0.043)	(0.048)	(0.093)
OBBP – Payment records		0.008	0.063	0.119**	-0.029
		(0.055)	(0.051)	(0.059)	(0.113)
2015 [b]		0.092	-0.394**	-0.311*	-0.199
		(0.167)	(0.155)	(0.170)	(0.400)
2016		-0.058	-0.497***	-0.329**	0.007
		(0.138)	(0.126)	(0.140)	(0.328)

Table C.1 (Contd.)

Pooled Multinomial Logit Estimates – Use of Payment Methods (In-person)

	Payment Methods †				
	CA (BO) [a]	CHMO	DC	CC	PC
2017		-0.284**	-0.628***	-0.429***	0.112
		(0.138)	(0.126)	(0.139)	(0.323)
2018		-0.153	-0.469***	-0.220	0.371
		(0.139)	(0.126)	(0.139)	(0.320)
2019		-0.609***	-0.354***	-0.279**	-0.225
		(0.143)	(0.126)	(0.138)	(0.342)
Constant		-0.284**	-0.628***	-0.429***	0.112
		(0.138)	(0.126)	(0.139)	(0.323)
N	11,008				
Pseudo R^2	0.158				

Note. Pooled multinomial logit regression coefficients are presented for payment methods used for in-person transactions. Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

† CA is Cash, CHMO denotes Check and Money Order, DC is Debit Card, CC is Credit Card, and PC is Prepaid Card.

[a] Base outcome (BO) is Cash (CA).

[b] Female respondents, White respondents, income of more than $100,000, having an advanced degree (e.g., Masters or Doctorate degree), disabled and retired respondents and the year dummy for 2020 are the reference categories.

Table C.2

Random Effects Multinomial Logit Estimates - Use of Payment Methods (In-person)

	Payment Methods †				
	CA (BO) [a]	CHMO	DC	CC	PC
Extroversion		0.003	0.006	0.011*	0.027
		(0.006)	(0.006)	(0.007)	(0.019)
Agreeableness		0.005	0.019**	0.002	-0.006
		(0.008)	(0.007)	(0.009)	(0.021)
Conscientiousness		0.022***	-0.002	0.013	-0.031
		(0.008)	(0.007)	(0.008)	(0.02)
Neuroticism		0.025***	0.01	0.024***	0.014
		(0.007)	(0.006)	(0.007)	(0.019)
Openness to Experience		-0.005	0.003	-0.009	0.008
		(0.007)	(0.006)	(0.007)	(0.017)
Age		0.025***	-0.0002	0.018***	-0.014
		(0.003)	(0.003)	(0.004)	(0.009)
Male		-0.147*	-0.298***	-0.152*	-0.328
		(0.083)	(0.078)	(0.087)	(0.22)
Black		-0.579***	-0.056	-0.48***	-0.267
		(0.153)	(0.123)	(0.172)	(0.329)
Asian		-0.08	-0.515	0.204	0.421
		(0.329)	(0.334)	(0.289)	(0.907)
Other race and mixed races		-0.448***	-0.212	-0.592***	0.44
		(0.169)	(0.136)	(0.181)	(0.334)
Hispanic/Latino origin		-0.449***	0.152	-0.364**	-0.494
		(0.17)	(0.136)	(0.178)	(0.449)
Less than $25,000		-0.537***	-0.127	-0.963***	-0.032
		(0.142)	(0.133)	(0.15)	(0.401)
$25,000 - $50,000		-0.188	0.403***	-0.593***	-0.325
		(0.124)	(0.121)	(0.125)	(0.365)
$50,000 - $75,000		-0.136	0.273**	-0.279**	-0.358
		(0.124)	(0.123)	(0.121)	(0.38)
$75,000 - $99,999		-0.155	0.39***	-0.168	-0.252
		(0.137)	(0.136)	(0.132)	(0.396)

Table C.2 (Contd.)

Random Effects Multinomial Logit Estimates - Use of Payment Methods (In-person)

	Payment Methods †			
	CA (BO) [a]	CHMO	DC	CC	PC
Less than high school degree	-0.545***	-0.456***	-2.005***	0.44
	(0.218)	(0.194)	(0.313)	(0.533)
High school graduate and some college experience	-0.146	-0.131	-0.87***	0.312
	(0.13)	(0.124)	(0.126)	(0.425)
Bachelor's degree	0.172	-0.001	-0.407***	0.538
	(0.123)	(0.119)	(0.115)	(0.398)
Employed	0.239**	0.142	-0.148	-0.09
	(0.094)	(0.088)	(0.102)	(0.26)
Unemployed	-0.291	-0.195	-0.298	0.115
	(0.178)	(0.144)	(0.194)	(0.359)
Born in the U.S.	0.287	0.301*	-0.411**	0.021
	(0.192)	(0.163)	(0.171)	(0.498)
Northeast	-0.031	-0.339***	-0.161	-0.134
	(0.124)	(0.126)	(0.133)	(0.363)
Midwest	-0.055	-0.145	-0.252**	-0.112
	(0.101)	(0.094)	(0.105)	(0.285)
West	-0.254*	-0.233*	0.163	-0.097
	(0.148)	(0.133)	(0.147)	(0.386)
South	-0.107	0.07	-0.206*	-0.035
	(0.105)	(0.094)	(0.111)	(0.273)
Financial Literacy Score	-0.017	-0.080***	0.052***	-0.118***
	(0.053)	(0.014)	(0.016)	(0.033)
Declared bankruptcy	0.129	0.123	-0.772***	0.438
	(0.520)	(0.150)	(0.245)	(0.370)
Overdrawn bank account	-0.580**	0.287***	-0.613***	-0.079
	(0.280)	(0.073)	(0.103)	(0.199)
Experienced fraudulent activity	0.722**	0.094	-0.012	-0.296
	(0.324)	(0.092)	(0.097)	(0.245)

Table C.2 (Contd.)

Random Effects Multinomial Logit Estimates – Use of Payment Methods (In-person)

	Payment Methods †				
	CA (BO) [a]	CHMO	DC	CC	PC
Cash - Acceptance		0.019	-0.032	0.034	-0.149
		(0.046)	(0.043)	(0.049)	(0.13)
Cash - Cost		-0.013	-0.081*	-0.05	-0.001
		(0.05)	(0.046)	(0.054)	(0.112)
Cash - Convenience		-0.193***	-0.251***	-0.242***	-0.05
		(0.04)	(0.036)	(0.041)	(0.104)
Cash - Risk		0.003	-0.024	0.02	-0.018
		(0.03)	(0.028)	(0.032)	(0.087)
Cash – Getting and setting up		-0.105**	-0.132***	-0.092*	-0.17
		(0.046)	(0.041)	(0.048)	(0.114)
Cash – Payment records		-0.01	-0.02	-0.049	-0.107
		(0.035)	(0.033)	(0.039)	(0.096)
Check - Acceptance		0.002	-0.102***	-0.031	-0.08
		(0.043)	(0.038)	(0.045)	(0.119)
Check - Cost		0.036	0.059	0.12**	-0.026
		(0.051)	(0.046)	(0.053)	(0.128)
Check - Convenience		0.318***	0.099**	0.003	-0.113
		(0.044)	(0.04)	(0.046)	(0.125)
Check - Risk		0.095**	-0.039	-0.002	-0.044
		(0.043)	(0.038)	(0.044)	(0.105)
Check – Getting and setting up		0.169***	0.076	0.1*	0.102
		(0.055)	(0.049)	(0.056)	(0.129)
Check – Payment records		0.136**	-0.031	-0.072	-0.045
		(0.057)	(0.051)	(0.058)	(0.127)
Money Order - Acceptance		0.045	0.032	0.042	0.114
		(0.036)	(0.033)	(0.038)	(0.105)
Money Order - Cost		-0.083**	0.005	-0.102**	-0.033
		(0.043)	(0.04)	(0.045)	(0.122)
Money Order - Convenience		-0.115***	-0.12***	-0.06	-0.144
		(0.044)	(0.042)	(0.05)	(0.134)
Money Order - Risk		0.052	-0.014	-0.018	-0.202*
		(0.039)	(0.035)	(0.04)	(0.106)
Money Order - Getting and setting up		-0.022	-0.033	-0.065	-0.004
		(0.046)	(0.043)	(0.049)	(0.117)
Money Order – Payment records		-0.054	-0.044	-0.074*	0.083
		(0.038)	(0.035)	(0.04)	(0.106)

Table C.2 (Contd.)

Random Effects Multinomial Logit Estimates – Use of Payment Methods (In-person)

	Payment Methods †				
	CA (BO) [a]	CHMO	DC	CC	PC
Debit Card - Acceptance		-0.039	0.241***	-0.062	0.088
		(0.066)	(0.071)	(0.071)	(0.192)
Debit Card - Cost		0.06	0.14***	-0.077	-0.084
		(0.051)	(0.049)	(0.054)	(0.121)
Debit Card - Convenience		0.04	0.449***	-0.29***	-0.017
		(0.057)	(0.06)	(0.061)	(0.161)
Debit Card - Risk		-0.015	0.079*	-0.209***	0.079
		(0.046)	(0.045)	(0.047)	(0.124)
Debit Card – Getting and setting up		-0.088	0.091	-0.055	0.175
		(0.061)	(0.059)	(0.067)	(0.169)
Debit Card – Payment records		-0.063	0.261***	-0.055	0.003
		(0.058)	(0.063)	(0.062)	(0.164)
Credit Card - Acceptance		0.097	0.084	0.116	-0.002
		(0.069)	(0.067)	(0.079)	(0.166)
Credit Card - Cost		0.045	-0.046	0.221***	-0.025
		(0.031)	(0.029)	(0.033)	(0.088)
Credit Card - Convenience		0.082	-0.077	0.421***	-0.122
		(0.056)	(0.054)	(0.068)	(0.127)
Credit Card - Risk		-0.023	-0.065	0.18***	-0.131
		(0.043)	(0.042)	(0.044)	(0.116)
Credit Card – Getting and setting up		0.13***	0.072*	0.239***	-0.199*
		(0.049)	(0.043)	(0.056)	(0.108)
Credit Card – Payment records		0.064	-0.107*	0.299***	-0.123
		(0.067)	(0.062)	(0.08)	(0.159)
Prepaid Card - Acceptance		0.05	-0.051	0.017	0.143
		(0.045)	(0.041)	(0.049)	(0.129)
Prepaid Card - Cost		-0.083**	-0.025	0.037	-0.12
		(0.042)	(0.038)	(0.043)	(0.105)
Prepaid Card - Convenience		-0.043	-0.033	0.034	0.257**
		(0.042)	(0.039)	(0.043)	(0.12)
Prepaid Card - Risk		-0.005	0.054	0.037	0.133
		(0.037)	(0.034)	(0.038)	(0.098)
Prepaid Card – Getting and setting up		0.001	-0.044	-0.043	0.372***
		(0.046)	(0.043)	(0.048)	(0.128)
Prepaid Card – Payment records		-0.042	-0.062*	-0.066*	0.17*
		(0.039)	(0.035)	(0.04)	(0.093)

Table C.2 (Contd.)

Random Effects Multinomial Logit Estimates – Use of Payment Methods (In-person)

	Payment Methods †				
	CA (BO) [a]	CHMO	DC	CC	PC
BANP - Acceptance		0.024	-0.02	-0.014	0.052
		(0.036)	(0.032)	(0.039)	(0.092)
BANP - Cost		-0.028	0.039	-0.074	0.201
		(0.058)	(0.054)	(0.063)	(0.154)
BANP - Convenience		0.013	0.011	0.018	0.039
		(0.042)	(0.037)	(0.042)	(0.118)
BANP - Risk		0.059	0.065*	0.106**	0.085
		(0.04)	(0.037)	(0.042)	(0.119)
BANP – Getting and setting up		-0.082	-0.012	-0.024	-0.012
		(0.053)	(0.05)	(0.056)	(0.146)
BANP – Payment records		-0.008	-0.008	-0.014	-0.052
		(0.055)	(0.053)	(0.058)	(0.163)
OBBP - Acceptance		-0.047	-0.009	-0.072*	-0.097
		(0.038)	(0.035)	(0.041)	(0.104)
OBBP - Cost		0.049	-0.009	0.067	0.038
		(0.061)	(0.057)	(0.067)	(0.154)
OBBP - Convenience		-0.125***	0.001	0.115**	-0.013
		(0.046)	(0.043)	(0.049)	(0.126)
OBBP - Risk		-0.081*	-0.006	-0.018	-0.062
		(0.043)	(0.04)	(0.046)	(0.123)
OBBP – Getting and setting up		-0.097*	0.047	-0.01	-0.12
		(0.051)	(0.049)	(0.054)	(0.138)
OBBP – Payment records		-0.01	0.072	0.135*	-0.064
		(0.061)	(0.06)	(0.07)	(0.168)

Table C.2 (Contd.)

Random Effects Multinomial Logit Estimates - Use of Payment Methods (In-person)

	Payment Methods †				
	CA (BO) [a]	CHMO	DC	CC	PC
Constant		-3.599***	-3.476***	-3.436***	-2.072
		(0.692)	(0.653)	(0.726)	(1.876)
var(u2)	1.084***				
	(0.081)				
var(u3)	1.168***				
	(0.073)				
var(u4)	1.34***				
	(0.08)				
Var(u5)	-1.806***				
	(0.256)				
N	11,008				
Pseudo R^2	0.186				

Note. Random effects multinomial logit regression coefficients are presented for payment methods used for in-person transactions. Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

† CA is Cash, CHMO denotes Check and Money Order, DC is Debit Card, CC is Credit Card, and PC is Prepaid Card.

[a] Base outcome (BO) is Cash (CA).

[b] Female respondents, White respondents, income of more than $100,000, having an advanced degree (e.g., Masters or Doctorate degree), disabled and retired respondents and the year dummy for 2020 are the reference categories.

Table C.3

Pooled Multinomial Logit Estimates – Use of Payment Methods (Online)

	Payment Methods †				
	CHMO	PC	DC	CC	ACH (BO) [a]
Extroversion	0.019*	0.000	-0.004	-0.002	
	(0.011)	(0.014)	(0.004)	(0.005)	
Agreeableness	-0.022	-0.014	0.001	-0.008	
	(0.013)	(0.015)	(0.006)	(0.006)	
Conscientiousness	-0.014	0.005	-0.015***	-0.011*	
	(0.014)	(0.015)	(0.005)	(0.006)	
Neuroticism	-0.009	0.016	-0.006	-0.000	
	(0.012)	(0.013)	(0.005)	(0.005)	
Openness to Experience	-0.013	0.014	0.022***	0.021***	
	(0.011)	(0.013)	(0.004)	(0.005)	
Age	-0.002	-0.040***	-0.023***	-0.007***	
	(0.006)	(0.006)	(0.002)	(0.003)	
Male [b]	0.116	-0.094	0.174***	0.165***	
	(0.136)	(0.158)	(0.057)	(0.060)	
Black [b]	0.233	0.497**	0.349***	-0.217	
	(0.226)	(0.220)	(0.093)	(0.143)	
Asian	0.471	-0.445	-0.596**	0.095	
	(0.451)	(0.795)	(0.261)	(0.184)	
Other race and mixed races	0.042	0.603**	-0.217*	-0.291**	
	(0.270)	(0.239)	(0.111)	(0.131)	
Hispanic/Latino origin	-0.008	-0.524*	0.148	-0.263*	
	(0.278)	(0.310)	(0.103)	(0.142)	
Less than $25,000 [b]	0.643***	1.336***	0.656***	-0.170	
	(0.242)	(0.367)	(0.100)	(0.108)	
$25,000 - $50,000	0.205	0.495	0.556***	-0.107	
	(0.227)	(0.369)	(0.089)	(0.085)	
$50,000 - $75,000	0.180	0.467	0.348***	-0.125	
	(0.226)	(0.383)	(0.088)	(0.079)	
$75,000 - $99,999	-0.010	-0.714	0.313***	-0.027	
	(0.259)	(0.564)	(0.096)	(0.083)	

Table C.3 (Contd.)

Pooled Multinomial Logit Estimates – Use of Payment Methods (Online)

	Payment Methods †				
	CHMO	PC	DC	CC	ACH (BO) [a]
Less than high school degree [b]	0.740**	1.857***	0.542***	-0.500**	
	(0.328)	(0.581)	(0.159)	(0.227)	
High school graduate and some college experience	0.294	1.432***	0.405***	-0.165**	
	(0.237)	(0.532)	(0.090)	(0.082)	
Bachelor's Degree	0.135	1.215**	0.215**	-0.140**	
	(0.234)	(0.530)	(0.085)	(0.071)	
Employed [b]	0.105	-0.406**	0.016	-0.134*	
	(0.155)	(0.181)	(0.066)	(0.071)	
Unemployed	0.047	0.409*	0.291**	0.195	
	(0.294)	(0.230)	(0.117)	(0.143)	
Born in the U.S.	-0.140	-0.172	0.172	-0.436***	
	(0.293)	(0.348)	(0.134)	(0.119)	
Northeast	0.309	-0.141	-0.095	-0.046	
	(0.217)	(0.309)	(0.095)	(0.094)	
Midwest	0.407**	0.315	-0.005	-0.067	
	(0.179)	(0.211)	(0.073)	(0.075)	
West	0.418	0.205	0.173*	0.307***	
	(0.256)	(0.303)	(0.101)	(0.098)	
South	0.185	0.294	0.113	-0.193**	
	(0.185)	(0.199)	(0.072)	(0.082)	
Financial Literacy Score	-0.089***	0.002	-0.055***	0.036***	
	(0.025)	(0.030)	(0.011)	(0.013)	
Declared bankruptcy	0.217	-0.058	0.135	-0.707***	
	(0.299)	(0.375)	(0.120)	(0.222)	
Overdrawn bank account	-0.111	-0.605***	0.289***	-0.515***	
	(0.158)	(0.181)	(0.058)	(0.081)	
Experienced fraudulent activity	-0.236	0.443**	0.051	-0.025	
	(0.203)	(0.182)	(0.072)	(0.077)	

Table C.3 (Contd.)

Pooled Multinomial Logit Estimates – Use of Payment Methods (Online)

	Payment Methods †				
	CHMO	PC	DC	CC	ACH (BO)
Cash - Acceptance	0.117	-0.176**	-0.083***	-0.081**	
	(0.084)	(0.087)	(0.031)	(0.034)	
Cash - Cost	0.006	0.101	0.035	0.004	
	(0.081)	(0.086)	(0.035)	(0.039)	
Cash - Convenience	0.078	0.036	-0.048*	-0.004	
	(0.071)	(0.080)	(0.026)	(0.028)	
Cash - Risk	-0.087*	0.075	-0.002	-0.018	
	(0.051)	(0.059)	(0.021)	(0.023)	
Cash – Getting and setting up	-0.064	0.026	-0.013	0.074**	
	(0.078)	(0.085)	(0.030)	(0.033)	
Cash – Payment records	0.126**	-0.027	-0.055**	-0.033	
	(0.057)	(0.065)	(0.025)	(0.028)	
Check - Acceptance	0.060	-0.028	-0.047*	0.023	
	(0.068)	(0.074)	(0.027)	(0.031)	
Check - Cost	0.054	-0.294***	-0.034	0.042	
	(0.088)	(0.088)	(0.035)	(0.038)	
Check - Convenience	0.104	-0.021	-0.011	-0.045	
	(0.075)	(0.083)	(0.030)	(0.032)	
Check - Risk	0.150**	0.102	0.020	0.100***	
	(0.074)	(0.079)	(0.028)	(0.031)	
Check – Getting and setting up	0.216**	-0.294***	-0.095***	-0.095**	
	(0.094)	(0.095)	(0.036)	(0.039)	
Check – Payment records	0.216**	-0.130	-0.002	-0.099**	
	(0.101)	(0.095)	(0.036)	(0.039)	
Money Order - Acceptance	0.008	0.030	-0.034	0.025	
	(0.060)	(0.069)	(0.025)	(0.027)	
Money Order - Cost	0.072	0.331***	0.099***	-0.079**	
	(0.071)	(0.084)	(0.029)	(0.031)	
Money Order - Convenience	0.148**	0.011	0.056*	0.029	
	(0.070)	(0.082)	(0.031)	(0.035)	
Money Order - Risk	0.092	-0.117	0.006	0.007	
	(0.068)	(0.075)	(0.026)	(0.028)	
Money Order - Getting and setting up	0.046	0.198**	0.072**	0.001	
	(0.078)	(0.086)	(0.032)	(0.034)	
Money Order – Payment records	-0.033	-0.002	-0.005	0.010	
	(0.069)	(0.077)	(0.026)	(0.028)	

Table C.3 (Contd.)

Pooled Multinomial Logit Estimates – Use of Payment Methods (Online)

	Payment Methods †				
	CHMO	PC	DC	CC	ACH (BO)
Debit Card - Acceptance	-0.182* (0.099)	-0.050 (0.135)	0.150*** (0.056)	-0.055 (0.050)	
Debit Card - Cost	-0.078 (0.083)	-0.033 (0.091)	0.142*** (0.037)	-0.089** (0.039)	
Debit Card - Convenience	-0.069 (0.088)	0.019 (0.113)	0.408*** (0.049)	-0.248*** (0.042)	
Debit Card - Risk	0.046 (0.079)	0.402*** (0.094)	0.156*** (0.034)	-0.091*** (0.031)	
Debit Card – Getting and setting up	-0.114 (0.100)	0.077 (0.111)	0.161*** (0.046)	-0.069 (0.047)	
Debit Card – Payment records	-0.032 (0.097)	-0.193 (0.121)	0.237*** (0.049)	-0.071* (0.041)	
Credit Card - Acceptance	-0.039 (0.101)	-0.060 (0.117)	0.054 (0.053)	-0.046 (0.058)	
Credit Card - Cost	0.171*** (0.056)	0.076 (0.065)	-0.035* (0.021)	0.240*** (0.023)	
Credit Card - Convenience	-0.166* (0.089)	-0.196** (0.095)	-0.194*** (0.042)	0.278*** (0.051)	
Credit Card - Risk	-0.061 (0.075)	-0.207** (0.088)	-0.162*** (0.032)	0.149*** (0.031)	
Credit Card – Getting and setting up	0.110 (0.086)	-0.311*** (0.077)	-0.073** (0.034)	0.146*** (0.042)	
Credit Card – Payment records	0.045 (0.106)	-0.085 (0.115)	-0.161*** (0.049)	0.294*** (0.058)	
Prepaid Card - Acceptance	0.020 (0.075)	0.346*** (0.100)	-0.031 (0.031)	0.069** (0.035)	
Prepaid Card - Cost	-0.048 (0.074)	-0.004 (0.083)	-0.023 (0.029)	0.033 (0.031)	
Prepaid Card - Convenience	-0.072 (0.072)	0.161* (0.092)	-0.032 (0.028)	0.055* (0.030)	
Prepaid Card - Risk	-0.001 (0.067)	0.016 (0.075)	0.002 (0.026)	0.006 (0.027)	
Prepaid Card – Getting and setting up	0.086 (0.082)	0.425*** (0.094)	0.036 (0.032)	0.021 (0.035)	
Prepaid Card – Payment records	-0.006 (0.070)	0.474*** (0.081)	0.012 (0.026)	-0.052* (0.028)	

Table C.3 (Contd.)

Pooled Multinomial Logit Estimates – Use of Payment Methods (Online)

	Payment Methods †				
	CHMO	PC	DC	CC	ACH (BO) [a]
BANP - Acceptance	-0.044	0.031	-0.004	-0.020	
	(0.057)	(0.066)	(0.024)	(0.027)	
BANP - Cost	-0.006	-0.031	0.044	-0.120***	
	(0.095)	(0.105)	(0.042)	(0.045)	
BANP - Convenience	-0.059	-0.165**	-0.091***	-0.063**	
	(0.070)	(0.078)	(0.028)	(0.030)	
BANP - Risk	-0.084	0.019	0.011	0.101	
	(0.143)	(0.036)	(0.039)	(0.090)	
BANP – Getting and setting up	0.075	0.015	-0.076	-0.235**	
	(0.175)	(0.048)	(0.049)	(0.103)	
BANP – Payment records	-0.184	-0.085	0.008	-0.184*	
	(0.192)	(0.052)	(0.051)	(0.109)	
OBBP - Acceptance	-0.049	0.009	-0.037	-0.064**	
	(0.061)	(0.072)	(0.026)	(0.029)	
OBBP - Cost	-0.304***	-0.145	-0.120***	0.003	
	(0.093)	(0.104)	(0.043)	(0.047)	
OBBP - Convenience	-0.198***	-0.043	-0.101***	-0.088**	
	(0.075)	(0.085)	(0.032)	(0.034)	
OBBP - Risk	-0.152**	-0.311***	-0.078***	-0.166***	
	(0.074)	(0.083)	(0.030)	(0.032)	
OBBP – Getting and setting up	-0.142*	-0.167*	-0.043	-0.118***	
	(0.084)	(0.099)	(0.037)	(0.038)	
OBBP – Payment records	-0.212**	0.069	-0.058	-0.081	
	(0.094)	(0.117)	(0.047)	(0.050)	
2015 [b]	0.193	-0.337	-0.377***	-0.327**	
	(0.299)	(0.375)	(0.125)	(0.133)	
2016	0.216	0.133	-0.367***	-0.218**	
	(0.246)	(0.283)	(0.100)	(0.109)	

Table C.3 (Contd.)

Pooled Multinomial Logit Estimates – Use of Payment Methods (Online)

	Payment Methods †				
	CHMO	PC	DC	CC	ACH (BO) [a]
2017		-1.513***	-1.786***	-2.631***	
		(0.404)	(0.383)	(0.388)	
2018		-1.498***	-1.628***	-2.540***	
		(0.372)	(0.357)	(0.361)	
2019		-1.409***	-1.490***	-1.773***	
		(0.376)	(0.360)	(0.363)	
Constant		2.289**	5.809***	6.291***	
		(1.056)	(0.975)	(0.999)	
N	11,170				
Pseudo R^2	0.179				

Note. Pooled multinomial logit regression coefficients are presented for payment methods used for online transactions. Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

†CHMO denotes Check and Money Order, PC is Prepaid Card, DC is Debit Card, CC is Credit Card, ACH consists of BANP (Bank Account Number Payments) and OBBP (Online Banking Bill Payments) transfers.

[a] Base outcome (BO) is ACH transfers (ACH).

[b] Female respondents, White respondents, income of more than $100,000, having an advanced degree (e.g., Masters or Doctorate degree), disabled and retired respondents and the year dummy for 2020 are the reference categories.

Table C.4

Random Effects Multinomial Logit Estimates - Use of Payment Methods (Online)

	Payment Methods †				
	CHMO	PC	DC	CC	ACH (BO) [a]
Extroversion	0.008	-0.003	-0.001	0.028*	
	(0.026)	(0.006)	(0.006)	(0.015)	
Agreeableness	-0.03	0.005	-0.015**	-0.029*	
	(0.025)	(0.007)	(0.008)	(0.018)	
Conscientiousness	0.011	-0.022***	-0.014*	-0.013	
	(0.026)	(0.007)	(0.007)	(0.017)	
Neuroticism	0.024	-0.005	-0.0004	-0.012	
	(0.025)	(0.006)	(0.006)	(0.014)	
Openness to Experience	0.015	0.028***	0.022***	-0.019	
	(0.025)	(0.006)	(0.006)	(0.015)	
Age	-0.057***	-0.030***	-0.004	0.001	
	(0.012)	(0.003)	(0.003)	(0.007)	
Male [b]	-0.259	0.183**	0.231***	0.094	
	(0.273)	(0.074)	(0.078)	(0.176)	
Black [b]	0.698*	0.511***	-0.21	0.343	
	(0.372)	(0.119)	(0.176)	(0.299)	
Asian	-1.171	-0.839***	0.177	0.398	
	(2.006)	(0.317)	(0.221)	(0.604)	
Other race and mixed races	0.847**	-0.839***	0.177	0.398	
	(0.419)	(0.147)	(0.156)	(0.354)	
Hispanic/Latino origin	-0.940*	0.297**	-0.420**	0.024	
	(0.519)	(0.135)	(0.182)	(0.383)	
Less than $25,000 [b]	1.897***	1.031***	-0.448***	0.867***	
	(0.603)	(0.131)	(0.138)	(0.328)	
$25,000 - $50,000	0.48	0.863***	-0.301***	0.29	
	(0.588)	(0.117)	(0.109)	(0.307)	
$50,000 - $75,000	0.337	0.554***	-0.296***	0.256	
	(0.626)	(0.116)	(0.102)	(0.293)	
$75,000 - $99,999	-1.06	0.496***	-0.141	0.016	
	(0.968)	(0.123)	(0.110)	(0.331)	

Table C.4 (Contd.)

Random Effects Multinomial Logit Estimates - Use of Payment Methods (Online)

	Payment Methods †				
	CHMO	PC	DC	CC	ACH (BO) [a]
Less than high school degree [b]	2.551**	0.567***	-0.845***	0.992**	
	(1.008)	(0.196)	(0.289)	(0.433)	
High school graduate and some college experience	1.808**	0.551***	-0.290***	0.411	
	(0.915)	(0.113)	(0.109)	(0.294)	
Bachelor's Degree	1.391	0.266**	-0.240**	0.231	
	(0.878)	(0.109)	(0.094)	(0.300)	
Employed [b]	-0.466	0.136	-0.246***	0.16	
	(0.309)	(0.087)	(0.092)	(0.206)	
Unemployed	0.67	0.449***	0.16	0.134	
	(0.432)	(0.153)	(0.191)	(0.363)	
Born in the U.S.	-0.457	0.207	-0.648***	-0.162	
	(0.591)	(0.169)	(0.148)	(0.398)	
Northeast	-0.461	-0.077	0.057	0.306	
	(0.470)	(0.120)	(0.117)	(0.258)	
Midwest	0.36	0.064	0.012	0.455**	
	(0.359)	(0.091)	(0.093)	(0.214)	
West	0.073	0.286**	0.413***	0.505	
	(0.537)	(0.127)	(0.127)	(0.324)	
South	0.433	0.232***	-0.248**	0.124	
	(0.348)	(0.089)	(0.104)	(0.231)	
Financial Literacy Score	-0.089***	0.002	-0.055***	0.036***	
	(0.025)	(0.030)	(0.011)	(0.013)	
Declared bankruptcy	0.217	-0.058	0.135	-0.707***	
	(0.299)	(0.375)	(0.120)	(0.222)	
Overdrawn bank account	-0.111	-0.605***	0.289***	-0.515***	
	(0.158)	(0.181)	(0.058)	(0.081)	
Experienced fraudulent activity	-0.236	0.443**	0.051	-0.025	
	(0.203)	(0.182)	(0.072)	(0.077)	

Table C.4 (Contd.)

Random Effects Multinomial Logit Estimates - Use of Payment Methods (Online)

	Payment Methods †				
	CHMO	PC	DC	CC	ACH (BO) [a]
Cash - Acceptance	-0.193	-0.110***	-0.086*	0.147	
	(0.140)	(0.040)	(0.044)	(0.104)	
Cash - Cost	0.124	0.015	-0.01	0.014	
	(0.146)	(0.044)	(0.050)	(0.103)	
Cash - Convenience	-0.01	-0.036	0.017	0.078	
	(0.143)	(0.034)	(0.037)	(0.090)	
Cash - Risk	-0.087*	0.075	-0.002	-0.018	
	(0.051)	(0.059)	(0.021)	(0.023)	
Cash – Getting and setting up	-0.064	0.026	-0.013	0.074**	
	(0.078)	(0.085)	(0.030)	(0.033)	
Cash – Payment records	0.126**	-0.027	-0.055**	-0.033	
	(0.057)	(0.065)	(0.025)	(0.028)	
Check - Acceptance	0.060	-0.028	-0.047*	0.023	
	(0.068)	(0.074)	(0.027)	(0.031)	
Check - Cost	0.054	-0.294***	-0.034	0.042	
	(0.088)	(0.088)	(0.035)	(0.038)	
Check - Convenience	0.104	-0.021	-0.011	-0.045	
	(0.075)	(0.083)	(0.030)	(0.032)	
Check - Risk	0.150**	0.102	0.020	0.100***	
	(0.074)	(0.079)	(0.028)	(0.031)	
Check – Getting and setting up	0.216**	-0.294***	-0.095***	-0.095**	
	(0.094)	(0.095)	(0.036)	(0.039)	
Check – Payment records	0.216**	-0.130	-0.002	-0.099**	
	(0.101)	(0.095)	(0.036)	(0.039)	
Money Order - Acceptance	0.008	0.030	-0.034	0.025	
	(0.060)	(0.069)	(0.025)	(0.027)	
Money Order - Cost	0.072	0.331***	0.099***	-0.079**	
	(0.071)	(0.084)	(0.029)	(0.031)	
Money Order - Convenience	0.148**	0.011	0.056*	0.029	
	(0.070)	(0.082)	(0.031)	(0.035)	
Money Order - Risk	0.092	-0.117	0.006	0.007	
	(0.068)	(0.075)	(0.026)	(0.028)	
Money Order - Getting and setting up	0.046	0.198**	0.072**	0.001	
	(0.078)	(0.086)	(0.032)	(0.034)	
Money Order – Payment records	-0.033	-0.002	-0.005	0.010	
	(0.069)	(0.077)	(0.026)	(0.028)	

Table C.4 (Contd.)

Random Effects Multinomial Logit Estimates - Use of Payment Methods (Online)

	Payment Methods †				
	CHMO	PC	DC	CC	ACH (BO) [a]
Debit Card - Acceptance	-0.182*	-0.050	0.150***	-0.055	
	(0.099)	(0.135)	(0.056)	(0.050)	
Debit Card - Cost	-0.078	-0.033	0.142***	-0.089**	
	(0.083)	(0.091)	(0.037)	(0.039)	
Debit Card - Convenience	-0.069	0.019	0.408***	-0.248***	
	(0.088)	(0.113)	(0.049)	(0.042)	
Debit Card - Risk	0.046	0.402***	0.156***	-0.091***	
	(0.079)	(0.094)	(0.034)	(0.031)	
Debit Card – Getting and setting up	-0.114	0.077	0.161***	-0.069	
	(0.100)	(0.111)	(0.046)	(0.047)	
Debit Card – Payment records	-0.032	-0.193	0.237***	-0.071*	
	(0.097)	(0.121)	(0.049)	(0.041)	
Credit Card - Acceptance	-0.039	-0.060	0.054	-0.046	
	(0.101)	(0.117)	(0.053)	(0.058)	
Credit Card - Cost	0.171***	0.076	-0.035*	0.240***	
	(0.056)	(0.065)	(0.021)	(0.023)	
Credit Card - Convenience	-0.166*	-0.196**	-0.194***	0.278***	
	(0.089)	(0.095)	(0.042)	(0.051)	
Credit Card - Risk	-0.061	-0.207**	-0.162***	0.149***	
	(0.075)	(0.088)	(0.032)	(0.031)	
Credit Card – Getting and setting up	0.110	-0.311***	-0.073**	0.146***	
	(0.086)	(0.077)	(0.034)	(0.042)	
Credit Card – Payment records	0.045	-0.085	-0.161***	0.294***	
	(0.106)	(0.115)	(0.049)	(0.058)	
Prepaid Card - Acceptance	0.020	0.346***	-0.031	0.069**	
	(0.075)	(0.100)	(0.031)	(0.035)	
Prepaid Card - Cost	-0.048	-0.004	-0.023	0.033	
	(0.074)	(0.083)	(0.029)	(0.031)	
Prepaid Card - Convenience	-0.072	0.161*	-0.032	0.055*	
	(0.072)	(0.092)	(0.028)	(0.030)	
Prepaid Card - Risk	-0.001	0.016	0.002	0.006	
	(0.067)	(0.075)	(0.026)	(0.027)	
Prepaid Card – Getting and setting up	0.086	0.425***	0.036	0.021	
	(0.082)	(0.094)	(0.032)	(0.035)	
Prepaid Card – Payment records	-0.006	0.474***	0.012	-0.052*	
	(0.070)	(0.081)	(0.026)	(0.028)	

Table C.4 (Contd.)

Random Effects Multinomial Logit Estimates - Use of Payment Methods (Online)

	Payment Methods †				
	CHMO	PC	DC	CC	ACH (BO) [a]
BANP - Acceptance	-0.045	0.006	-0.03	-0.047	
	(0.112)	(0.031)	(0.035)	(0.071)	
BANP - Cost	0.007	0.081	-0.150**	0.002	
	(0.181)	(0.054)	(0.059)	(0.124)	
BANP - Convenience	-0.23	-0.110***	-0.066*	-0.07	
	(0.151)	(0.036)	(0.038)	(0.098)	
BANP - Risk	0.070	-0.089	0.013	0.014	
	(0.071)	(0.079)	(0.028)	(0.030)	
BANP – Getting and setting up	-0.208**	-0.045	0.005	-0.053	
	(0.085)	(0.101)	(0.037)	(0.039)	
BANP – Payment records	-0.132	-0.203**	-0.032	-0.015	
	(0.087)	(0.103)	(0.040)	(0.041)	
OBBP - Acceptance	0.054	-0.047	-0.065*	-0.06	
	(0.124)	(0.034)	(0.037)	(0.070)	
OBBP - Cost	-0.106	-0.173***	0.039	-0.316**	
	(0.172)	(0.056)	(0.061)	(0.125)	
OBBP - Convenience	0.034	-0.098**	-0.080*	-0.208**	
	(0.150)	(0.042)	(0.044)	(0.094)	
OBBP - Risk	-0.491***	-0.084**	-0.161***	-0.194**	
	(0.149)	(0.038)	(0.042)	(0.097)	
OBBP – Getting and setting up	-0.416**	-0.019	-0.130***	-0.170*	
	(0.168)	(0.047)	(0.049)	(0.101)	
OBBP – Payment records	0.117	-0.034	-0.114*	-0.182	
	(0.210)	(0.061)	-0.062	(0.119)	

Table C.4 (Contd.)

Random Effects Multinomial Logit Estimates - Use of Payment Methods (Online)

	Payment Methods †				
	CHMO	PC	DC	CC	ACH (BO) [a]
Constant		-2.823	-1.021	1.108*	1.309
		(2.445)	(0.626)	(0.661)	(1.528)
var(u2)	2.697***				
	(0.372)				
var(u3)	1.540***				
	(0.076)				
var(u4)	1.548***				
	(0.081)				
Var(u5)	-1.400***				
	(0.204)				
N	11,170				
Pseudo R^2	0.222				

Note. Pooled multinomial logit regression coefficients are presented for payment methods used for online transactions. Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

†CHMO denotes Check and Money Order, PC is Prepaid Card, DC is Debit Card, CC is Credit Card, ACH consists of BANP (Bank Account Number Payments) and OBBP (Online Banking Bill Payments) transfers.

[a] Base outcome (BO) is ACH transfers (ACH).

[b] Female respondents, White respondents, income of more than $100,000, having an advanced degree (e.g., Masters or Doctorate degree), disabled and retired respondents and the year dummy for 2020 are the reference categories.