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Consumer Payment Behavior by Income and Demographics

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Abstract:
Despite the introduction of an array of innovations and new payment options for consumers over the last decade, income and demographics remain significant predictors of payment behavior. Using data from a 2023 consumer payments diary, we find that income, age, and education are significant predictors of which payment instruments consumers adopt and use. These associations hold not only for traditional payment instruments—cards and paper—but also for innovations such as mobile apps; buy now, pay later (BNPL); and cryptocurrency. In 2023, less educated consumers were significantly less likely than other consumers to adopt any payment instrument, especially checks and electronic payments, even when we control for income and employment. After controlling for education, we find that high-income consumers used credit cards significantly more relative to other consumers. Younger and more educated consumers were most likely to adopt mobile payment apps. Women, Black and Latino consumers, and those who had filed for bankruptcy in the previous year were significantly more likely to have used BNPL. Men were nearly three times as likely as women to adopt cryptocurrency.

JEL Classifications: E41, D14, D12
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1. Introduction

Consumer payment behavior is highly heterogenous. Previous studies show that consumer payment behavior varies with income and demographic characteristics (Stavins 2016, 2017) and that even within a given demographic cohort, consumers frequently exhibit very different patterns of payment instrument use. Previous research attributes some of these within-cohort differences to consumers' individual perceptions of a payment instrument's characteristics such as whether it is safe, convenient, or low cost.

We use new data from the 2023 Survey and Diary of Consumer Payment Choice (SDCPC), a nationally representative diary survey of US adults, to examine how consumer payment behavior varies by income and demographic attributes and test whether these factors matter more than consumer perceptions of payment instruments' characteristics.

Following Schuh and Stavins (2010, 2013), we estimate a probit regression for bank account adoption and the two-stage Heckman model of adoption and use of payment instruments. In addition to examining the adoption and use of paper, card, and electronic payment instruments, we investigate consumer behavior surrounding payment innovations, including the use of buy now, pay later (BNPL); holding cryptocurrency; and adopting mobile payment apps (including the bank person-to-person [P2P] payment app Zelle and the nonbank P2P payment apps PayPal, Venmo, and Cash App). We explore how the adoption and use of these newer payment options vary across consumers with different demographic attributes.

We find the following:

- Income, age, education, and credit scores were the most significant factors affecting the adoption and use of any payment instrument in 2023.
- The same factors were important a decade ago (Schuh and Stavins 2010, 2013), and despite years of innovation in payments, they remained important for payment choices.
- Self-reported FICO scores were positively correlated with adopting a checking account and using credit cards (higher scores were associated with a higher likelihood of adoption and use), and they were negatively correlated with the use of cash and debit cards.
- Demographic and financial variables were not the only factors that mattered for consumer payment choice; individuals' assessments of the characteristics of

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different payment instruments also mattered, especially regarding the decision to adopt a payment instrument.

- Assessments of characteristics improve the goodness of fit in both adoption and use regressions, although more of the variation among consumers in both adoption and use of payment instruments is explained by their demographic and financial attributes.
- Consumers' choices concerning payment innovations, including the use of mobile payment apps, BNPL, and cryptocurrency, were also affected by demographic and financial attributes. In addition to age, education, and income, race affected BNPL use and the acquisition of cryptocurrency.

The rest of the paper is as follows. Section 2 summarizes the existing literature on consumer payment choice, and Section 3 describes the data used in this study. The next three sections focus on differences among various demographic and financial cohorts of consumers: Section 4 presents summary statistics on the adoption of bank accounts and estimates a probit model of bank account adoption; Section 5 presents summary statistics and estimates the two-stage Heckman model of adoption and use of payment instruments; and Section 6 explores how income and demographics have affected the adoption and use of innovative ways to pay. Section 7 concludes.

2. Literature review

Previous literature finds that consumer payment choice varies with income and with demographic attributes (see, for example, Bertaut and Haliassos 2006; Klee 2006; Stavins 2001). In addition, studies show that consumer assessments of payment-method characteristics affect payment use (Ching and Hayashi 2010; Koulayev et al. 2016; Schuh and Stavins 2010, 2013).

While all the payment options analyzed in those earlier studies still exist, consumers can now spread payments for purchases over time by using BNPL. They also can use mobile payment apps, and they can obtain cryptocurrency. Stavins (2024) and Aidala et al. (2024) show that financially fragile consumers are more likely to use BNPL. DiMaggio et al. (2022) find that lower-income consumers are more likely to use BNPL compared with higher-income consumers, but the authors' data do not allow them to observe other consumer attributes, such as race and gender. Auer and Tercero-Lucas (2021), using data from the Survey of Consumer Payment Choice, find that crypto adopters tend to be educated, young, digital natives, and male. A survey by the Pew Research Center (Anderson 2022) finds that two-thirds of Americans who are 50 and

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older have never used a payment app and that the adoption of specific apps varies with race and ethnicity.

This paper contributes to the literature on consumer payment behavior by using the specific reporting method of diary survey recording and by expanding the range of payment methods investigated. Schuh and Stavins (2010, 2013) use data that relied on consumers' recall of what they did in a typical month. By contrast, this study uses data from a consumer payments diary, in which consumers record every transaction they conduct during a specified three-day period. In addition, the data incorporate not only the traditional choices of paper, cards, and electronic payment instruments, but also a new payer-experience layer that includes mobile pay and BNPL. The data also contain information on the adoption of cryptocurrency.

3. Data

As noted, we use data from the 2023 SDCPC, which is conducted annually in October by the Federal Reserve Banks of Atlanta and Boston and Federal Reserve Financial Services. Each year since 2015, SDCPC respondents have reported their checking and savings bank account holdings, the payment instruments they possess or have adopted, and how they use those payment instruments. Payment instruments include cash, paper checks, credit cards, debit cards, prepaid cards, and electronic payments out of bank accounts (bank account number payment and online banking bill payment[2]). Survey participants record their transactions during three consecutive days. Transactions include purchases (in person or online), bill payments, person-to-person payments, and ATM withdrawals and deposits. Participants' three-day response periods are evenly distributed throughout October so that on each day of the month, an equal number of overlapping respondents record their first-, second-, and third-day payment information. The data used in this study are described in greater detail in Foster et al. (2024); Foster and Diallo (2024) provide more technical background on the survey methodology used to collect the data. In 2023, the nationally representative sample included 4,209 respondents, who collectively conducted 18,457 transactions.

[2] Bank account number payment (BANP) is defined in the survey questionnaire as "You pay by giving your bank's number [sometimes called a 'routing number'] and your account number." Online banking bill payment (OBBP) is defined in the survey questionnaire as "A payment made from your bank's online banking website or mobile app."

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A. Demographics

Table 1 shows the demographic breakdown of the sample. We apply individual-level post-stratification weights in the calculation of individual-level summary statistics so that the data are representative of the US population; for transaction-level summary statistics, we use day-of-week weights because October 2023 did not have an equal number of each day of the week. Summary statistics at both the individual and transaction levels are calculated using the nationally representative sample.[3] As the table shows, transactions are not evenly distributed across the demographic cohorts. In particular, consumers aged 25 to 34 comprise 11 percent of the sample but conducted more than 21 percent of the transactions. The two oldest groups (55 to 64 and 65 and older) are slightly underrepresented regarding their number of transactions. A breakdown by income shows that the lowest-income consumers—those with an annual household income of less than $25,000—represent almost 23 percent of the sample but conducted only 15 percent of the transactions. By contrast, the highest-income consumers comprise 33 percent of the sample but conducted more than 45 percent of the transactions. Employed consumers also conducted a disproportionally large number of transactions compared with consumers who were either unemployed or out of the labor force.

Survey respondents report their FICO credit scores. Rather than asking for the exact score, the survey asks respondents to select a cohort: below 600, 600 to 649, 650 to 699, etc. Although the response rate for FICO scores in the 2023 diary is not perfect—approximately 9 percent of respondents did not know their scores (Table 1)—most respondents provided their score range. Because credit scores reflect consumers' creditworthiness and their likelihood of repaying loans on time, they are an important aspect of payment behavior.

Self-reported credit scores might be overstated; previous research shows that people tend to overestimate their credit scores in self-reported surveys (Homonoff et al. 2021; Perry 2008). In our sample, approximately 29 percent of the respondents who reported a credit score claimed to

[3] The 2023 diary includes a nationally representative sample as well as 370 additional diarists from an oversample of California. All summary statistics here are calculated using only the observations from the nationally representative sample, with corresponding weights. For details on the construction of these weights, see the codebook for the 2023 diary on the Federal Reserve Bank of Atlanta website: https://www.atlantafed.org/-/media/documents/banking/consumer-payments/survey-diary-consumer-payment-choice/2023/dcpc2023_codebook.pdf.

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be in the highest category (over 800), whereas FICO classified 24 percent of the population in that category in October 2023.[4]

A small share of respondents—2.6 percent—reported that they had filed for bankruptcy during the preceding year. In our analysis, we examine how past bankruptcy filing affects consumers' payment adoption and use.

B. Characteristics

Participants in the 2023 SDCPC were asked to assess each payment method according to the following characteristics: cost, acceptance, convenience, security, setup, record keeping, and speed. For each payment method, respondents rated each of those characteristics on a scale of 1 to 5, with 1 equaling the least desirable (for example, least secure or most expensive) and 5 the most desirable (most secure or least costly). (See the Appendix for the survey questions about characteristics.)

Using data from earlier surveys, Schuh and Stavins (2010, 2013) show that, besides demographics and income, consumers' assessments of a payment instrument's characteristics significantly affect whether they adopt and use that instrument. Acceptance is the only characteristic that measures potential supply-side restrictions by payees; all the other characteristics can be affected by both supply and demand factors. For example, while the cost of a payment instrument is partly affected by whether financial institutions or merchants impose fees or give discounts for using the payment instrument, it is also influenced by a consumer's specific circumstances such as the type of deposit account or the type of credit card that the consumer holds.

By including these ratings in regressions, we can estimate their effect on payment choice while controlling for income and demographics. Including all the characteristic ratings in the regression would generate a large number of right-hand-side variables and therefore a large number of coefficients to estimate. Eight payment methods (cash, check, money order, credit cards, debit cards, prepaid cards, online banking bill pay, and bank account number payment) and seven characteristics (cost, acceptance, convenience, security, setup, record keeping, and

[4] See Can Arkali, "Average U.S. FICO Score at 718," *FICO Decisions Blog*, October 30, 2023. https://www.fico.com/blogs/average-us-fico-score-718.

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speed) would generate 56 variables to include in the regressions. Instead, we compute the average of each respondent's ratings of each payment method relative to their ratings of all the other methods. (See the Appendix for the details of this transformation.)

4. Bank account adoption

A. Summary statistics

Having a bank account is a prerequisite for adopting and then using some payment instruments, including debit cards, checks, online banking bill pay (OBBP), and bank account number payment (BANP). While nearly 96 percent of US consumers have at least one bank account,[5] the division between banked and unbanked consumers is not equally distributed among various income and demographic cohorts. (All numbers in the summary statistics tables are weighted using the nationally representative weights.)

Table 2 shows the percentage of consumers in 2023 who had any bank account (column 1) as well as the share who had a checking account (column 2) and the share with a savings account (column 3). Checking account ownership was much more common than savings account ownership: 95 percent of consumers versus 78.6 percent. Bank account holding was highest among the oldest group and increased monotonically with education and with income. Only 81.1 percent of consumers without a high school education held a bank account, compared with 99 percent of college graduates and 100 percent of consumers with a graduate degree. Among the lowest-income consumers, 83.9 percent had a bank account, compared with 100 percent of consumers in the highest-income cohort. Employed consumers and homeowners were more likely to have a bank account relative to those who were unemployed or rented their home. White consumers and Asian consumers were each more likely than Black consumers to have a bank account. Consumers with low credit scores were less likely to have a bank account, while almost everyone with a self-reported credit score greater than 700 had a bank account.

[5] The number of unbanked consumers in our data is consistent with the number reported by the Federal Deposit Insurance Corporation (FDIC), which estimates that 4.5 percent of US households were unbanked in 2021. See "2021 National Survey of Unbanked and Underbanked Households Executive Summary," https://www.fdic.gov/analysis/household-survey/2021execsum.pdf.

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The differences among income and demographic cohorts were especially large for savings account holding, suggesting that low-education and low-income consumers were significantly less likely to have any financial cushion and were more likely to be liquidity constrained. That inference is consistent with the findings in Greene and Stavins (2023).

B. Regression results

While a savings account provides a means of saving money, a checking account is essential for liquidity and for accessing many payment instruments. We therefore focus on the factors affecting the probability of holding a checking account. We test whether the effect of demographic attributes on the most held type of bank account—a checking account—remains significant when all other variables are held constant. Table 3 shows the results of a probit regression in which the dependent variable equals one if consumer *i* had adopted a checking account and zero otherwise.

Because only 5 percent of consumers are unbanked (Table 2), all estimated marginal effects are very small in magnitude. As expected, low-income, less educated, and unemployed consumers were less likely to have a checking account. Consumers in the lowest FICO credit score cohort and those who did not know their FICO score were significantly less likely to have a checking account when we control for other financial or demographic attributes.

5. Payment instrument adoption

With most payment instruments, consumers first decide whether to adopt it (extensive margin) and then how often to use it to conduct transactions (intensive margin). For example, a consumer must apply for a credit card before they can use that card. For some payment methods, such as BANP, adoption occurs when a consumer uses it.

The set of payment instruments that each consumer could adopt includes paper methods (cash, checks, and money orders), payment cards (debit, credit, and prepaid), electronic payments (OBBP and BANP), and cryptocurrency. We measure adoption of payment instrument *j* by consumer *i* in period *t* as follows:

$$A_{ijt} \equiv \begin{cases} 1 & \text{if consumer } i \text{ has adopted payment instrument } j \text{ in period } t \\ 0 & \text{otherwise,} \end{cases}$$

where *j* = {cash, check, money order, debit, credit, prepaid, OBBP, BANP, crypto}.

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A. Summary statistics

Table 4 shows, by demographic cohort, the percentage of consumers who adopted each payment instrument.[6] The rates of adoption range from 95.4 percent for cash[7] to 8.6 percent for cryptocurrency and 5.8 percent for money orders.

Almost all consumers had adopted cash regardless of their income or demographic attributes. By contrast, check adoption varied significantly by age, education, and income. Only about one quarter of the youngest consumers held checks, compared with 90.9 percent of consumers aged 65 and older. The differences by education are also pronounced: 42.7 percent of consumers with less than a high school education held checks compared with 87.3 percent of those with a graduate degree. By income, check adoption ranges from 50.9 percent of the lowest-income consumers to 83.4 percent of those in the highest-income cohort. Debit card, credit card, and electronic payments adoption all increase with education and income. The top panels of Figures 1, 2, and 3 summarize adoption of payment instruments by age, education, and income, respectively.

Compared with consumers who reported high credit scores, those in the lowest credit-score cohort were significantly less likely to have checks or credit cards but significantly more likely to have money orders.

B. Regression results

In our model, consumers first decide whether to adopt a payment instrument and then choose how to pay for purchases given their set of options. To estimate consumers' adoption and use of payments, we apply the two-stage Heckman (1976) selection model. The Heckman model corrects for potential sample-selection bias that might arise if adoption and use are estimated independently.

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[6] As noted earlier, all numbers in the summary statistics tables are weighted using the nationally representative weights.

[7] The SDCPC includes a few separate questions related to cash adoption and use, asking whether the participant holds cash, makes a payment using cash, gets/stores cash, or has used cash in the last 30 days. If a respondent answers yes to any of those questions, they are identified as a cash adopter.

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We estimate the likelihood of adoption of payment method *j* by consumer *i* using the following probit specification:

$$A_{ij} = A(\overline{RCHAR}_{ij}, DEM_i, Y_i, Z_i). \quad (1)$$

Because almost all survey participants (96 percent) had adopted cash, we do not estimate a cash adoption regression. $\overline{RCHAR}_{ij}$ is a vector of relative characteristics of payment *j* (cost, acceptance, convenience, security, setup, record keeping, and speed); DEM_i is a vector of demographic variables (age, education, gender, marital status, race, ethnicity, number of household members, and a dummy variable indicating whether consumer *i* resides in an urban or rural area); Y_i is a set of financial variables (income, employment status, self-reported FICO score, bankruptcy, and homeownership); and Z_i is a set of control variables excluded from the instrument-use stage to identify the Heckman two-stage model. Table 5 shows the results of the adoption regressions (stage 1 of the Heckman model). Each column represents a different payment instrument, with the dependent variable equal to one if consumer *i* adopted that instrument and zero otherwise. The numbers shown in the table represent estimated marginal effects at the means (for continuous variables) or marginal effects of a discrete change relative to the baseline (for categorical variables). The numbers can be interpreted as the percentage-point effect of each variable on the probability of adoption of a given payment instrument. We exclude survey respondents who recorded no transactions during the diary period because we cannot calculate a share of transactions using any payment instruments if the denominator is equal to zero. While our base specification includes the relative characteristics of payment instruments, in a later section of this paper, we test whether including them in the regressions improves the goodness of fit.

Younger consumers were less likely to adopt checks: Compared with the omitted 65-and-older group, consumers younger than 25 had a 37 percent lower probability of adopting checks. Less educated consumers were significantly less likely to adopt all payment instruments, especially checks and electronic payments, even when we control for income and employment. Unemployed consumers were less likely to adopt any instrument except for prepaid cards, which may be used for unemployment benefit disbursements. Consumers in the lowest FICO-score cohort were 25 percentage points less likely to have checks and 31 percentage points less likely to have credit cards relative to those in the highest FICO-score cohort, probably due to supply-

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side restrictions. However, the low-FICO-score consumers (like unemployed consumers) were more likely than consumers in the top FICO-score cohort to have adopted prepaid cards. Figure 4 shows adoption of credit cards by FICO score.

The results in Table 5 also show that when income and demographics are held constant, consumers' subjective assessments of payment instrument characteristics influence their adoption decision.[8] Subjective assessments of payment instrument characteristics can vary within demographic groups. Even though many of the demographic and income variables are significant, characteristics of payment instruments have a large and significant effect on payment instrument adoption. Positive and significant coefficients on a characteristic indicate that, after we control for all the demographic and financial variables, consumers who gave a given payment instrument a high rating for that characteristic relative to other payment instruments were significantly more likely to adopt the instrument. Consumers' assessment of convenience, record keeping, setup, and speed all had large and significant effects on the probability of adopting a given payment instrument.

Table 6 summarizes consumers' assessments, showing that in almost every case, adopters, on average, gave higher ratings relative to non-adopters for a given payment instrument along every characteristic. The characteristic with the largest discrepancy in ratings between adopters and nonadopters was convenience, followed by setup, suggesting that these may have been the main reasons consumers did not adopt certain payment instruments.

6. Payment instrument use

Once consumers adopt a payment instrument, they decide how often to use it for transactions, either in person or online. Although the adoption decision can be made in conjunction with the use decision—for example, a person can sign up for online banking and then immediately pay a bill online—adoption is a prerequisite for use. Therefore, in our model, the two decisions are made sequentially. That is, after they adopt payment instruments, consumers decide which of those instruments to use when conducting each transaction.

[8] The one exception is prepaid cards. Because many of the examples in the questionnaire relate to disbursement for various public benefits programs, the determining factor may be eligibility for these rather than a personal (dis)satisfaction with them.

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Survey participants record individual transactions and the payment instrument they used for each transaction in the diary on a daily basis, but they could fail to report all their payments. We address this possibility by using shares instead of the absolute number of transactions conducted with each instrument because shares are less likely to be biased by reporting errors. For example, if respondents consistently underreport across all the payment instruments they use, the shares will remain the same even though the absolute number of transactions will be biased downward.

We measure consumer *i*'s use of payment instrument *j* as the share of all transactions conducted by consumer *i* using payment instrument *j*:

$$U_{ijt} \equiv \left(n_{ijt} / N_{it} \right),$$

where $N_{it} \equiv \sum_j n_{ijt}$ is the total number of payments made by consumer i in period *t* using all their payment instruments. We assume that any underreporting of transactions would affect all payment instruments equally; therefore, shares are less likely to be affected by any reporting issues relative to absolute numbers of transactions.

A. Summary statistics

Table 7 shows the percentage of transactions conducted in 2023 using each category of payment instruments: paper (cash, check, and money order), cards (debit, credit, and prepaid), electronic (OBBP and BANP), and other (mobile payment apps, account-to-account transfers, and income deduction). Table 8 further breaks down those results into the percentages of transactions paid with individual payment instruments. About two-thirds of all transactions were conducted with payment cards (Table 7). Transactions conducted with paper instruments constitute almost 19 percent of all transactions, while electronic payments comprise 12.5 percent of transactions. Younger, highly educated, and high-income consumers conducted a significantly higher share of transactions using cards compared with their counterparts. The reverse is true for paper methods: The oldest, least educated, and lowest-income consumers conducted the highest share of transactions with paper instruments.

Table 8 provides a more detailed comparison of the shares of transactions conducted with the various payment methods. Credit and debit cards were the most heavily used payment

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methods in 2023, having been used in 32 percent and 30 percent of all transactions, respectively. Cash was the third most common, used in 16 percent of all transactions. As earlier studies find for previous years (see, for example, Stavins 2016), in 2023, the oldest, least educated, lowest-income, and Black consumers were most likely to use cash. Debit cards were most heavily used by the least educated consumers and Black consumers, while credit cards were most commonly used by the highest educated, wealthiest, and Asian consumers. Consumers with graduate degrees and those with an annual household income of more than $100,000 used credit cards for about 51 percent and 44 percent of all transactions, respectively. The share of transactions conducted with checks declined over the years to just 2.7 percent in 2023, but the oldest consumers used checks for almost 6 percent of their transactions. The bottom panels of Figures 1, 2, and 3 summarize shares of payments by payment instruments by age, education, and income, respectively.

Payment use varied with credit scores. Consumers in the lowest FICO-score cohort used cash twice as much as those with credit scores above 650. Consumers with credit scores below 650 conducted about half of their transactions with debit cards and less than 8 percent with credit cards. By contrast, consumers with credit scores above 800 used debit cards for only 14 percent of their transactions and used credit cards for about half of the transactions.

B. Regression results

In the second stage of the Heckman model, we estimate the use of each payment instrument *j* by consumer *i* as follows:

$$U_{ij} = U(\overline{RCHAR}_{ij}, DEM_i, Y_i, MR_i^{-1}), \quad (2)$$

where U_{ij} is the ratio of the number of payments consumer *i* made using payment type *j* to the total number of payments made by consumer *i* in a month, and MR_i^{-1} is the inverse Mills ratio from the first-stage Heckman probit model to control for simultaneity of payment instrument adoption and payment instrument use.

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Table 9 shows the results of the use regressions (stage 2 of the Heckman model).[9] The dependent variable is the share of all transactions conducted by consumer *i* using a given payment instrument. Because we do not estimate a cash adoption regression, we estimate cash use with OLS (last column in the table).

The Heckman model requires that some of the variables included in the first stage are excluded from the second stage. We exclude the following variables, which we believe affect adoption but are less likely to affect use: setup, acceptance, bankruptcy, rural/urban, and number of household residents.[10]

Older, less educated, lower-income, and Black consumers used cash significantly more than their counterparts, even when all the other demographic and financial attributes are held constant. Consumers with less than a high school degree had an 11 percentage point larger share of cash use compared with consumers who had a graduate degree, and consumers with an annual household income of less than $25,000 had an 8 percentage point larger share than those with a household income of more than $100,000 a year. Consumers in the lowest FICO-score group had an 8 percentage point larger share of cash use than the omitted group of those with a FICO score over 800.

Low-FICO-score consumers used debit cards more intensively than high-FICO-score consumers, while the opposite is observed for credit cards: Consumers with a FICO score below 650 had a 23 percentage point larger share of debit card use and a 21 to 23 percentage point smaller share of credit card use for their transactions compared with the omitted category of consumers in the top FICO-score cohort (above 800). The least educated consumers used debit cards more and credit cards less than consumers with any other level of education. After controlling for education, we find that high-income consumers used credit cards significantly more than consumers in other income cohorts.

[9] We estimated the Heckman regressions with and without the FICO scores. The estimated coefficients are very similar when the FICO scores are excluded, but including them improves the goodness of fit—the adjusted R-squared increases for all the regressions. The results without the FICO scores are available from the authors.

[10] For robustness, we estimated the second-stage Heckman regressions with various combinations of omitted variables. The estimated coefficients on the included variables remained very similar.

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For robustness, we estimated the Heckman regressions with and without FICO scores. The inverse Mills ratio is not statistically significant in any of the regressions, suggesting that we do not identify selection problems and that using OLS instead of the second-stage Heckman regressions might yield unbiased results.

Rating cash highly in terms of convenience, record keeping, and security increased cash use significantly. Convenience was the most important characteristic affecting cash use; consumers who rated cash more convenient than other payment instruments had substantially larger shares of cash use compared with other consumers. Convenience also had a highly significant effect on the use of four other payment instruments: credit card, debit card, check, and prepaid card. Other characteristics are not significant in the use regressions (Table 9).

How much of the variation in adoption and use is explained by the relative characteristics? We estimate all the regressions with and without the relative characteristics and compare their respective goodness of fit, as measured by pseudo R^2 (for first-stage probit regressions) and by adjusted R^2 (for second-stage OLS regressions). Both goodness of fit measures are shown at the bottom of the Heckman regression results tables. A comparison reveals that although characteristics marginally improve the goodness of fit in both adoption and use regressions, more of the cross-sectional variation among consumers is explained by their demographic and financial attributes. Thus, income and demographics were more important than individuals' assessments in affecting payment decisions.

7. Payment innovations

A. Mobile payment app adoption

Summary statistics

While mobile apps such as PayPal, Venmo, and Zelle have become increasingly popular for making payments, they are not, strictly speaking, payment instruments. In fact, most transactions conducted using mobile payment apps are settled through traditional methods such as credit cards, debit cards, or automated clearing house (ACH). Nevertheless, the growing popularity of such apps shows that consumers are increasingly more comfortable using their phones to make payments, and it is worth noting the associations between various demographic characteristics and the adoption and use of mobile technology.

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Table 10 shows the adoption rates for mobile payment apps. Almost three-quarters of all consumers had adopted any mobile payment app in 2023. The most commonly adopted were PayPal (35.2 percent of participants) and Venmo (32.5 percent). Mobile-payment-app adoption was higher for younger respondents and increased with education and with income (Figure 5). The youngest consumers were almost twice as likely to have adopted a mobile payment app compared with the oldest consumers, and 89 percent of those with a graduate degree had adopted a mobile payment app compared with barely half of those with less than a high school education.

Adoption rates also varied across different apps: While PayPal, Venmo, and Zelle were more likely to be held by high-income and highly educated consumers and those who are Asian, Cash App was much more likely to be held by consumers with low income or minimal education or Black consumers. Almost half of consumers in the lowest FICO-score cohort had adopted Cash App compared with only 8.8 percent of those in the highest cohort. More than 40 percent of consumers who had filed for bankruptcy in the previous year had Cash App, compared with fewer than 20 percent of those who had not filed for bankruptcy.

Regression

Younger consumers were more likely to have adopted mobile payment apps. Compared with the omitted group of consumers who were 65 and older, consumers younger than 25 had a 33 percent greater probability of having adopted an app (Table 5). Younger, more highly educated, and employed consumers were most likely to have adopted a mobile payment app. Consumers with a household income of less than $75,000 were less likely to have adopted an app. Compared with consumers in the highest FICO-score cohort, consumers in the lowest cohort were significantly more likely to have adopted a mobile payment app.

B. Use of buy now, pay later

Summary statistics

In 2023, survey participants were asked questions about buy now, pay later. Because BNPL is not a payment instrument but rather a way to spread out a given transaction amount over multiple payments (most often four), we analyze it separately from payment instrument adoption and use. Table 11 shows the percentage of consumers who used BNPL at some point during the previous

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30 days (column 1) and the percentage who used it more than once during the same period (column 2).

In October 2023, 9.3 percent of consumers had used BNPL during the previous 30 days, and only 3.9 percent had used it more than once. Although the share of consumers using BNPL was still relatively low, it had increased from 6.6 percent two years earlier (Stavins 2024). Data collected in December or January might show higher levels of use due to holiday shopping, but the survey is administered at the same time every year, so year-to-year changes are not affected by seasonal influences. Consumers most likely to have used BNPL had a FICO score below 650, only a high school education, and an annual household income of less than $75,000, and they were female and Black or Latino. Black, Latino, and female consumers were also most likely to have used BNPL more than once in 30 days. Almost one-quarter of consumers who had filed for bankruptcy in the previous year used BNPL compared with 8.8 percent of other consumers. (For more on BNPL use in October 2023, see Stavins 2024.) Figure 4 compares BNPL adopters (defined as consumers who used it at least once in the previous 30 days) with credit card and crypto adopters by credit score.

Regression

BNPL is not a physical or electronic payment instrument that is adopted the way other instruments are adopted. Therefore, we define BNPL adoption as having used it at least once during the previous 30 days. Table 12 shows the results of a probit regression in which the dependent variable equals one if a consumer used BNPL at least once during the previous 30 days and zero otherwise. After controlling for all the other demographic and financial variables, we find that women, Black and Latino consumers, and those who had filed for bankruptcy in the previous year were significantly more likely to have used BNPL. FICO scores had the strongest effect on BNPL use, possibly because consumers with low FICO scores were not able to obtain credit cards, had low credit limits on their cards, or had exhausted their credit limit. Consumers in the lowest and second-lowest FICO-score cohorts were, respectively, 18 percentage points and 17 percentage points more likely to use BNPL than those in the omitted category of consumers with a FICO score over 800.

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C. Cryptocurrency adoption

Summary statistics

Although the rate of cryptocurrency adoption was much lower than that of any of the traditional payment methods (8.6 percent, see Table 4), the heterogeneity of adoption is notable. In particular, the consumers who were most likely to hold cryptocurrency were 25 to 44 years old, had a college degree, had an annual household income of more than $100,000, were Asian, were single, and lived in urban settings. Men (12.6 percent) were significantly more likely than women (4.7 percent) to adopt cryptocurrency.

Regression

Because cryptocurrency is not typically used as a means of payment, we analyze cryptocurrency adoption separately from payment instrument adoption. Table 13 shows the results of a probit regression in which the dependent variable equals one if consumer *i* had adopted cryptocurrency and zero otherwise. Consumers in the 35–44 age cohort were more likely to adopt crypto than consumers in any other age group. Even after we control for age and income, retired consumers were 3 percentage points less likely to adopt crypto than employed consumers. Men were almost 6 percentage points more likely to adopt crypto than women, and Asian consumers were 3 percentage points more likely to adopt crypto than white consumers.

8. Conclusions

Using new survey and diary data to analyze consumer payment behavior, we estimate the effects of financial and demographic variables on the adoption and use of payment instruments. We find that patterns identified in studies from more than a decade ago have persisted. Age, education, and income remain the most important determinants for both the adoption and use of many payment instruments. For example, older, less educated, lower-income, and Black consumers continue to use cash more frequently than their counterparts. We also show that, as with the legacy payment instruments, the adoption and use of new payment options, including mobile apps and BNPL, vary significantly with demographic and financial factors.

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References

Aidala, Felix, Daniel Mangrum, and Wilbert van der Klaauw. 2024. "How and Why Do Consumers Use 'Buy Now, Pay Later'?" Federal Reserve Bank of New York, *Liberty Street Economics* (blog). February 14.

Anderson, Monica. 2022. "Payment Apps Like Venmo and Cash App Bring Convenience—and Security Concerns—to Some Users." Pew Research Center Short Reads. September 8.

Auer, Raphael, and David Tercero-Lucas. 2021. "Distrust or Speculation? The Socioeconomic Drivers of US Cryptocurrency Investments." Bank for International Settlements Working Paper No. 951.

Bertaut, Carol C., and Michael Haliassos. 2006. "Credit Cards: Facts and Theories." *The Economics of Consumer Credit,* ed. Guisseppe Bertola, Richard Disney, and Charles Grant, 181–237. Cambridge, MA: MIT Press.

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

Di Maggio, Marco, Justin Katz, and Emily Williams. 2022. "Buy Now, Pay Later Credit: User Characteristics and Effects on Spending Patterns." Working paper. http://dx.doi.org/10.2139/ssrn.4198320

Foster, Kevin, and Antar Diallo. 2024. "Data Guide to the 2023 Diary of Consumer Payment Choice." Federal Reserve Bank of Atlanta.

Foster, Kevin, Claire Greene, and Joanna Stavins. 2024. "2023 Survey and Diary of Consumer Payment Choice: Summary Results." Federal Reserve Bank of Atlanta Research Data Report No. 24-1. https://www.atlantafed.org/-/media/documents/banking/consumer-payments/survey-diary-consumer-payment-choice/2023/sdcpc_2023_report.pdf

Greene, Claire, and Joanna Stavins. 2023. "Credit Card Debt Puzzle: Liquid Assets to Pay Bills." *International Review of Economics* 70: 503–535.

Homonoff, Tatiana, Rourke O'Brien, and Abigail B. Sussman. 2021. "Does Knowing Your FICO Score Change Financial Behavior? Evidence from a Field Experiment with Student Loan Borrowers." *The Review of Economics and Statistics* 103(2): 236–250.

Klee, Elizabeth. 2006. "Families' Use of Payment Instruments during a Decade of Change in the US Payment System." Board of Governors of the Federal Reserve System FEDS Working Paper No. 2006-01.

Koulayev, Sergei, Marc Rysman, Scott Schuh, and Joanna Stavins. 2016. "Explaining Adoption and Use of Payment Instruments by US Consumers." *RAND Journal of Economics* 47(2): 293–325.

Perry, Vanessa Gail. 2008. "Is Ignorance Bliss? Consumer Accuracy in Judgments about Credit Ratings." *Journal of Consumer Affairs* 42(2): 189–205.

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

Electronic copy available at: https://ssrn.com/abstract=4914698

Schuh, S., and J. Stavins. 2013. "How Consumers Pay: Adoption and Use of Payments." *Accounting and Finance Research* 2(2): 1–21.

Stavins, Joanna. 2001. "Effect of Consumer Characteristics on the Use of Payment Instruments." Federal Reserve Bank of Boston *New England Economic Review* 2001(3): 19–31.

Stavins, Joanna. 2016. "The Effect of Demographics on Payment Behavior: Panel Data with Sample Selection." Federal Reserve Bank of Boston Research Department Working Paper No. 16-5.

Stavins, Joanna. 2017. "How Do Consumers Make Their Payment Choices?" Federal Reserve Bank of Boston Research Data Report No. 17-1.

Stavins, Joanna. 2024. "Buy Now, Pay Later: Who Uses It and Why." Federal Reserve Bank of Boston Current Policy Perspectives 24-3.

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Table 1: Sample composition, individuals and transactions, by demographic attributes

		Individuals			Transactions		
		Number of observations (unweighted)	% of observations (unweighted)	Number of observations (weighted)	Number of observations (unweighted)	% of observations (unweighted)	Number of observations (weighted)
All individuals		4209	100.00	4209	18457	100.00	18457
Age:	*<25*	129	3.06	259.17	431	4.50	830.74
	25–34	481	11.43	903.26	1971	21.47	3963.21
	35–44	842	20.00	742.54	3897	18.64	3440.52
	45–54	788	18.72	671.21	3567	16.99	3135.28
	55–64	827	19.65	663.2	3569	15.59	2878.06
	65+	1142	27.13	969.62	5022	22.81	4209.19
Highest education:	*No high school*	157	3.73	252.99	388	4.04	744.88
	High school	680	16.16	1326.43	2117	24.43	4508.74
	Some college	872	20.72	671.14	3576	16.53	3050.62
	College graduate	1650	39.20	1269.85	7677	33.98	6271.8
	Graduate school	849	20.17	686.18	4691	20.91	3859.87
Gender:	*Female*	2544	60.44	2121.73	10979	51.54	9512.69
	Male	1665	39.56	2087.27	7478	48.46	8944.31
Marital status:	*Married*	2365	56.19	2299.69	10964	58.15	10732.37
	Divorced/Separated	694	16.49	562.95	2884	13.17	2430.01
	Widowed	225	5.35	203.44	847	4.38	808.9
	Never married	925	21.98	1142.93	3762	24.30	4485.72
Race:	*White*	3270	77.69	2946.61	14662	70.87	13080.36
	Black	459	10.91	553.59	1737	11.70	2159.71
	Asian	216	5.13	343.15	951	8.74	1612.52
	Other	254	6.03	350.98	1053	8.33	1537.84
Ethnicity	*Latino*	309	7.34	487.1	1386	13.34	2462.19
	Non-Latino	3900	92.66	3721.9	17071	86.66	15994.81
Urbanicity:	*Urban*	1346	31.98	1438.81	6668	39.15	7226.7
	Suburban	2140	50.84	2079.61	9271	48.29	8913.56
	Rural	720	17.11	685.81	2509	12.49	2305.03
Income:	*<$25,000*	958	22.76	894.68	2987	15.20	2804.68
	$25,000–$49,999	660	15.68	652.92	2528	13.06	2411.32
	$50,000–$74,999	634	15.06	623.59	2780	14.96	2760.41
	$75,000–$99,999	542	12.88	491.42	2399	11.31	2087.81
	>$100,000	1409	33.48	1542.04	7738	45.43	8384.43
Employment status:	*Employed*	2328	55.31	2469.1	11198	64.14	11837.42
	Unemployed	192	4.56	238.97	574	4.12	760.74
	Retired	910	21.62	763.95	4024	18.46	3407.79
	Other	775	18.41	730.97	2651	13.25	2444.96
FICO score:	*<600*	396	9.41	399.39	1352	7.43	1371.89
	600–649	360	8.55	379.7	1341	7.91	1460.19
	650–699	377	8.96	411.5	1578	8.75	1614.24
	700–749	618	14.68	627.85	3011	16.69	3081.06
	750–799	846	20.10	910.55	3852	23.14	4271
	>800	1225	29.10	1044.64	6184	29.21	5390.84
	Unknown	383	9.10	429.86	1130	6.77	1250.4
Bankrupt in past year?	*Yes*	110	2.61	123.75	540	3.14	580.1
	No	4097	97.34	4082.38	17909	96.76	17859.79
Home ownership:	*Homeowner*	2862	68.00	2642.4	13182	67.35	12431.17
	Non-homeowner	1344	31.93	1563.47	5266	32.55	6008.45

Source: Authors' calculations based on the 2023 Survey and Diary of Consumer Payment Choice.

Note: Results are weighted using the nationally representative weights.

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Table 2: Adoption of bank accounts: any bank account, checking account, savings account

		% of each demographic adopting…		
		Bank account	Checking account	Savings account
All individuals		95.7	95.0	78.6
Age:	*<25*	92.5	90.3	78.1
	25–34	95.0	94.0	81.0
	35–44	95.6	95.3	77.3
	45–54	95.6	94.9	81.8*
	55–64	96.2	94.9	76.4
	65+	97.1**	97.1***	76.8
Highest education:	*No high school*	81.1***	80.8***	56.4***
	High school	93.2***	92.0***	69.1***
	Some college	95.8	95.2	78.9
	College graduate	99.0***	98.6***	86.3***
	Graduate school	100.0***	99.4***	90.5***
Gender:	*Female*	96.0	95.4	79.2
	Male	95.5	94.6	77.9
Marital status:	*Married*	98.2***	97.9***	83.5***
	Divorced/Separated	92.4**	91.1***	71.3***
	Never married	92.3***	90.9***	73.7***
Race:	*White*	97.0***	96.3***	79.7*
	Black	86.8***	85.7***	67.0***
	Asian	98.2**	97.2*	83.6*
	Other	97.6*	97.5**	82.7
Ethnicity	*Latino*	95.4	94.8	76.9
	Non-Latino	95.8	95.0	78.8
Urbanicity:	*Urban*	95.9	95.4	81.5***
	Suburban	95.2	94.3	79.5
	Rural	96.9	96.3	69.6***
Income:	*<$25,000*	83.9***	82.4***	56.1***
	$25,000–$49,999	96.6	95.0	74.8*
	$50,000–$74,999	98.5***	98.4***	79.8
	$75,000–$99,999	99.4***	98.8***	82.7*
	>$100,000	100.0***	99.7***	91.4***
Employment status:	*Employed*	97.8***	97.4***	83.7***
	Unemployed	82.9***	78.9***	57.8***
	Retired	98.1***	98.0***	80.0
	Other	90.9***	89.5***	66.8***
FICO score:	*<600*	82.7***	81.3***	48.3***
	600–649	94.1	92.7	69.4***
	650–699	96.1	96.0	72.5**
	700–749	99.7***	97.9***	86.8***
	750–799	98.6***	98.3***	87.7***
	>800	99.7***	99.3***	90.0***
	Unknown	87.7***	87.1***	61.7***
Bankrupt in past year?	*Yes*	93.8	93.8	73.8
	No	95.8	95.0	78.7
Home ownership:	*Homeowner*	98.6***	98.4***	83.9***
	Non-homeowner	91.0***	89.3***	69.6***

Source: Authors' calculations based on the 2023 Survey and Diary of Consumer Payment Choice.
Note: Results are weighted using the nationally representative weights. Asterisks indicate results of a test of difference in means between the rate of adoption for a demographic group and rate of adoption for observations outside that demographic group; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

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Table 3: Probit regression results, estimated effects of demographics on checking account adoption

		Estimated percentage point effect on the probability of adopting checking account	
		(1)	(2)
Age:	*<25*	-0.16	-0.16
	25–34	-0.55	-0.47
	35–44	-0.96**	-0.74*
	45–54	-0.91**	-0.73*
	55–64	-0.51*	-0.43
	65+	--	--
Highest education:	*No high school*	-6.00***	-4.21***
	High school	-1.96***	-1.45***
	Some college	-1.55***	-1.22***
	College graduate	-0.57**	-0.53**
	Graduate school	--	--
Gender:	*Female*	--	--
	Male	0.10	0.04
Marital status:	*Married*	0.44	0.26
	Divorced/Separated	0.22	0.13
	Widowed	0.48	0.31
	Never married	--	--
Race:	*White*	--	--
	Black	-0.79*	-0.53
	Asian	-0.41	-0.58
	Other	0.48**	0.43**
Ethnicity:	*Latino*	0.02	0.07
	Non-Latino	--	--
# of household residents		-0.02	0.00
Urbanicity	*Rural*	-0.64	-0.59
	Mixed	--	--
	Urban	0.12	0.08
Income:	*<$25,000*	-4.75***	-3.48***
	$25,000–$49,999	-0.99**	-0.79**
	$50,000–$74,999	-0.42	-0.28
	$75,000–$99,999	-0.01	-0.01
	>$100,000	--	--
Employment status:	*Employed*	--	--
	Unemployed	-4.34***	-3.32***
	Retired	-0.16	-0.10
	Other	-1.48***	-1.11***
FICO score:	*<600*		-1.70**
	600–649		-0.46
	650–699		0.32
	700–749		0.27
	750–799		0.17
	>800		--
	Unknown		-2.55***
Bankruptcy in past year		0.45	0.48*
Home ownership:	*Homeowner*	1.65***	1.31***
	Non-homeowner	--	--
	Observations	4,547	4,546
	Pseudo-R^2	0.3443	0.3726

Source: Authors' calculations based on the 2023 Survey and Diary of Consumer Payment Choice.
Note: Results shown are estimated marginal effects at means (for continuous variables) and of a discrete change relative to the reference group (for categorical variables). "--" denotes the reference group for categorical variables.
* p<0.10, ** p<0.05, *** p<0.01.

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Table 4: Adoption of payment instruments

		% of each demographic adopting…								
		Cash	Checks	Money orders	Debit cards	Credit cards	Prepaid cards	OBBP[a]	BANP[b]	Crypto-currency
All individuals		95.4	71.3	5.8	90.1	81.9	65.8	57.5	46.2	8.6
Age:	*<25*	93.0	28.1***	6.4	88.8	73.2**	74.2*	35.6***	28.1***	13.2
	25–34	91.3***	55.8***	7.5	93.8***	79.0	73.8***	56.4	44.9	13.6***
	35–44	94.4	69.4	5.8	93.4***	77.2**	69.9**	58.9	45.9	14.6***
	45–54	95.3	73.4	5.5	91.0	83.3	65.4	63.3***	49.9*	5.9**
	55–64	98.1***	80.3***	7.1	88.0	83.5	61.0**	57.9	49.7	5.4***
	65+	99.1***	90.9***	3.4***	85.2***	88.3***	56.8***	58.8	47.2	2.3***
Highest education:	*No high school*	95.1	42.7***	9.4	78.3***	50.7***	58.8	33.7***	28.0***	1.6***
	High school	95.1	65.1***	7.9**	87.1***	72.4***	59.5***	49.1***	42.8**	4.9***
	Some college	95.5	64.6***	7.7	91.4	79.5	63.1	57.1	45.2	9.4
	College graduate	96.4	78.2***	4.1***	92.8***	91.7***	69.9***	62.5***	49.4**	12.6***
	Graduate school	94.3	87.3***	1.6***	94.1***	95.8***	75.8***	70.7***	52.6***	10.5
Gender:	*Female*	95.7	70.6	6.0	91.4**	83.3*	70.3***	59.3*	49.6***	4.7***
	Male	95.2	71.9	5.6	88.7**	80.4*	61.3***	55.7*	42.7***	12.6***
Marital status:	*Married*	96.4**	82.3***	3.8***	91.1*	89.0***	62.7***	60.2***	47.8*	8.7
	Divorced/Separated	96.3	64.8***	10.8***	88.4	73.5***	67.0	59.2	47.8	3.3***
	Widowed	98.5***	82.4***	7.5	88.1	83.5	59.4	56.2	47.1	0.9***
	Never married	92.6***	50.4***	6.9	89.2	71.2***	72.7***	51.1***	41.7**	12.5***
Race:	*White*	96.0*	75.6***	4.6***	89.6	83.2**	62.6***	55.9**	45.8	7.7**
	Black	95.0	53.3***	15.9***	88.1	68.1***	73.2***	60.1	48.6	7.9
	Asian	93.3	73.2	3.2*	93.2*	95.1***	75.8***	65.7**	46.0	20.3***
	Other	93.1	62.1**	2.3***	94.3**	79.3	72.1*	59.4	45.7	6.7
Ethnicity	*Latino*	92.7	48.3***	7.8	94.2***	79.7	70.3	58.7	45.3	12.2*
	Non-Latino	95.8	74.3***	5.5	89.6***	82.1	65.3	57.3	46.3	8.2*
Urbanicity:	*Urban*	95.8	69.4	5.2	93.1***	85.6***	75.7***	63.8***	46.7	13.9***
	Suburban	95.1	69.8	6.2	89.4	79.8**	63.4**	56.3	45.5	6.6***
	Rural	95.7	79.5***	5.7	85.7***	80.2	52.8***	47.7***	47.1	3.5***
Income:	*<$25,000*	95.6	50.9***	13.5***	81.5***	56.1***	71.3***	46.4***	38.8***	4.4***
	$25,000–$49,999	95.2	66.0**	8.9**	89.7	76.5***	63.2	49.9***	46.4	7.2
	$50,000–$74,999	96.2	74.2	4.3	92.0	86.2**	55.2***	55.3	47.9	7.4
	$75,000–$99,999	93.5	73.4	1.5***	92.0	85.9*	60.9*	61.0	49.3	4.7***
	>$100,000	95.8	83.4***	2.0***	93.9***	95.9***	69.8***	65.8***	48.1	13.4***
Employment status:	*Employed*	94.7**	71.1	5.5	94.0***	85.4***	66.9	60.3***	48.4***	11.8***
	Unemployed	93.1	30.3***	7.0	77.8***	58.4***	79.4***	39.0***	29.2***	7.6
	Retired	99.4***	92.6***	1.8***	84.7***	90.3***	52.7***	62.4**	46.6	1.6***
	Other	94.5	63.0***	10.6***	86.7**	69.0***	72.1***	46.9***	42.8	5.7**
FICO score:	*<600*	93.3	36.9***	16.9***	84.7**	42.8***	74.6***	49.4**	43.2	3.5***
	600–649	92.7	47.1***	12.6***	93.9**	64.2***	64.1	48.8**	48.2	5.6*
	650–699	92.7	63.6**	4.7	95.5***	81.0	64.1	58.0	47.5	6.2
	700–749	96.1	75.3*	3.3***	93.7***	94.4***	63.2	56.3	50.6*	11.0
	750–799	95.4	80.4***	3.6***	93.1***	94.5***	65.8	64.0***	45.0	13.9***
	>800	97.3***	93.2***	1.9***	87.9**	98.2***	63.9	66.7***	49.1*	8.1
	Unknown	97.1	54.3***	8.3	80.7***	49.6***	69.3	33.4***	33.3***	5.3**
Bankrupt in past year?	*Yes*	97.4	51.6***	6.5	95.6**	76.7	75.1*	68.8*	56.2	15.7
	No	95.4	71.9***	5.8	89.9**	82.0	65.5*	57.1*	45.9	8.4
Home ownership:	*Homeowner*	97.0***	84.9***	3.0***	90.4	89.8***	63.3***	61.3***	49.9***	8.2
	Non-homeowner	92.9***	48.4***	10.5***	89.6	68.4***	70.1***	50.5***	39.5***	9.3

Source: Authors' calculations based on the 2023 Survey and Diary of Consumer Payment Choice.
Note: Results are weighted using the nationally representative weights. Asterisks indicate results of a test of difference in means between the rate of adoption for a demographic group and rate of adoption for observations outside that demographic group; * p<0.10, ** p<0.05, *** p<0.01.
[a] Online banking bill payment.
[b] Bank account number payment.

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Table 5: Heckman first-stage (probit) results, estimated percentage point effects of demographics and subjective ratings on adoption of payment instruments

		Estimated effect on probability of adopting…						
		Checks	Debit Card	Credit Card	Prepaid Card	OBBP[a]	BANP[b]	Mobile Apps[c]
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
Relative[d] rating of method:	*Cost*	6.51**	5.94***	0.43	1.45	4.84	20.29***	3.83
	Acceptance	2.99*	2.53	-1.91	1.46	10.37***	10.91***	-5.69***
	Convenience	8.93***	7.54***	7.84***	4.06	31.95***	21.50***	12.44***
	Security	0.82	4.27***	2.12	-2.99	7.71***	6.80***	0.03
	Setting up	14.11***	4.55**	8.49***	3.78	24.77***	8.99***	12.17***
	Records	16.90***	10.74***	14.47***	-1.08	15.69***	22.04***	3.38
	Speed	-6.10***	5.47**	4.72**	8.54**	12.41***	5.03*	10.76***
Age:	*<25*	-37.16***	0.14	-2.69	8.39	-0.91	-1.35	32.77***
	25–34	-18.67***	1.91	-5.42**	4.53	0.62	-3.38	28.31***
	35–44	-14.26***	-0.50	-7.93***	6.94**	-3.40	-5.05	24.62***
	45–54	-11.02***	-2.95	-3.81**	4.31	-0.24	-0.52	16.87***
	55–64	-7.83***	-0.60	-2.33*	0.24	-2.24	-1.49	8.18***
	65+	--	--	--	--	--	--	--
Highest education:	*No high school*	-32.91***	-12.15***	-15.29***	-15.99***	-23.41***	-24.00***	-15.91***
	High school	-16.80***	-2.73	-5.32***	-15.01***	-12.42***	-11.63***	-8.37***
	Some college	-14.31***	-1.26	-3.13**	-11.67***	-10.08***	-9.39***	-3.51
	College graduate	-5.29***	-1.14	-1.33	-5.41***	-5.50**	-3.94*	-1.60
	Graduate school	--	--	--	--	--	--	--
Gender:	*Female*	--	--	--	--	--	--	--
	Male	-1.33	-1.88*	-1.66	-8.25***	-2.24	-2.76	-6.80***
Marital status:	*Married*	3.78*	1.17	3.87**	-4.29*	4.57*	-1.14	2.16
	Divorced/Separated	-2.75	3.81**	3.16*	-3.60	6.68**	0.22	4.51
	Widowed	-3.41	4.19**	4.46*	-5.76	8.15*	-4.68	3.90
	Never married	--	--	--	--	--	--	--
Race:	*White*	--	--	--	--	--	--	--
	Black	-15.53***	2.22	1.29	4.24	2.59	2.79	4.15
	Asian	-6.82*	0.54	5.53***	2.24	-3.23	-6.62*	-1.94
	Other	-6.52**	4.41***	-0.07	5.63*	2.40	4.00	7.21**
Ethnicity:	*Latino*	-16.60***	2.68*	0.32	-7.09**	1.11	-3.08	-5.35
	Non-Latino	--	--	--	--	--	--	--
# of household residents		-1.04***	0.27	-0.30	-0.74	-0.18	-1.10**	1.18**
Urbanicity	*Rural*	-1.38	-3.18**	-0.17	-4.25*	-3.19	0.72	-4.77**
	Mixed	--	--	--	--	--	--	--
	Urban	2.76*	1.66	3.21***	5.98***	5.72***	-1.07	-0.40
Income:	*<$25,000*	-11.71***	-8.32***	-9.39***	-0.09	-8.27***	-7.64***	-10.28***
	$25,000–$49,999	-1.38	-2.21	-4.65***	-8.04***	-7.22**	1.29	-5.90**
	$50,000–$74,999	-0.97	-0.98	-1.79	-10.69***	-2.78	1.26	-9.41***
	$75,000–$99,999	-1.81	-2.49*	-4.85***	-3.31	-1.96	5.94**	-3.97
	>$100,000	--	--	--	--	--	--	--
Employment status:	*Employed*	--	--	--	--	--	--	--
	Unemployed	-11.06***	-17.08***	-5.73**	6.58*	-10.25**	-18.05***	-18.03***
	Retired	5.10*	-2.61*	-1.50	-2.64	1.48	-7.24**	-1.06
	Other	-6.72***	-4.89***	-4.98***	4.53**	-4.57*	-5.26**	-4.70*
FICO score:	*<600*	-25.13***	2.07	-30.96***	8.85***	-6.04	6.47*	15.65***
	600–649	-16.47***	7.33***	-16.80***	2.02	-4.97	8.14**	16.32***
	650–699	-6.94***	8.23***	-8.30***	-1.97	-3.81	3.57	11.70***
	700–749	-2.47	5.11***	-4.12***	-1.69	-4.95*	4.46*	12.56***
	750–799	-1.28	4.23***	-1.61	0.94	-2.71	-0.19	2.38
	>800	--	--	--	--	--	--	--
	Unknown	-18.70***	-3.83	-32.37***	-1.05	-17.80***	-5.87*	-6.00*
Bankruptcy in past year		3.45	3.71*	5.34***	3.76	15.61***	17.58***	8.92*
Home ownership:	*Homeowner*	9.80***	1.02	3.91***	1.18	4.01*	5.97***	4.41**
	Non-homeowner	--	--	--	--	--	--	--
	Observations	3,979	3,780	3,886	3,924	3,898	4,030	3,974
	Pseudo-R^2	0.3805	0.1926	0.4329	0.0537	0.1548	0.1166	0.1657
	Pseudo-R^2 without ratings	0.3417	0.1197	0.3875	0.0479	0.0564	0.0346	0.1384

Source: Authors' calculations based on the 2023 Survey and Diary of Consumer Payment Choice.
Note: Results shown are estimated marginal effects at means (for continuous variables) and of a discrete change relative to the reference group (for categorical variables). "--" denotes the reference group for categorical variables. * p<0.10, ** p<0.05, *** p<0.01.
[a] Online banking bill payment.
[b] Bank account number payment.
[c] Any mobile payment app, including (but not limited to) PayPal, Venmo, and Zelle.
[d] Calculated as the log of a rating divided by the rating of another instrument, averaged over all other instruments.

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Table 6: Difference between average ratings of characteristics by adopters and non-adopters

	Characteristics (average adopter's rating – average non-adopter's rating, each on 1–5 scale)							
	Cost	Acceptance	Convenience	Security	Setup	Record keeping	Speed	Avg. difference for payment instrument
Cash	0.27	0.19	0.49	0.21	0.28	0.15	0.05	0.23
Check	0.33	0.44	0.44	0.18	0.58	0.54	0.24	0.39
Credit Card	0.42	0.34	0.65	0.48	0.70	0.64	0.50	0.53
Debit Card	0.36	0.42	0.56	0.33	0.46	0.66	0.55	0.48
Prepaid Card	0.05	0.01	0.10	-0.05	0.06	0.08	0.11	0.05
OBBP[a]	0.33	0.57	0.75	0.33	0.55	0.37	0.53	0.49
BANP[b]	0.29	0.52	0.64	0.30	0.35	0.32	0.39	0.40
Mobile Apps[c]	0.35	-0.01	0.64	0.19	0.66	0.52	0.54	0.41
Avg. difference for characteristic	0.30	0.31	0.53	0.25	0.45	0.41	0.36	0.37

Source: Authors' calculations based on the 2023 Survey and Diary of Consumer Payment Choice.
Note: Results are weighted using the nationally representative weights. Respondents rated each payment instrument according to each of the above characteristic on a scale of 1 to 5. Values in each cell are the average rating by adopters minus average rating by non-adopters.
[a] Online banking bill payment.
[b] Bank account number payment.
[c] Any mobile payment app, including (but not limited to) PayPal, Venmo, and Zelle.

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Table 7: Percentage of transactions conducted using each category of payment instruments

		% of all transactions using…			
		Paper methods	Payment cards	Electronic banking	Other methods
All individuals		18.8	64.8	12.5	3.9
Age:	*<25*	15.6*	69.7**	9.8*	4.9
	25–34	12.2***	71.0***	11.4*	5.4***
	35–44	13.9***	72.4***	10.9***	2.8***
	45–54	14.1***	69.3***	13.1	3.5
	55–64	24.2***	57.8***	13.9*	4.2
	65+	29.6***	53.2***	14.1***	3.2**
Highest education:	*No high school*	30.8***	60.0*	5.5***	3.7
	High school	26.0***	59.6***	11.2**	3.3*
	Some college	20.3*	62.8**	12.9	4.1
	College graduate	15.7***	66.4**	13.5**	4.5**
	Graduate school	12.3***	70.6***	13.6*	3.6
Gender:	*Female*	18.4	64.8	12.3	4.5***
	Male	19.3	64.7	12.8	3.2***
Marital status:	*Married*	17.5***	66.0***	13.1**	3.4***
	Divorced/Separated	23.4***	58.9***	13.4	4.3
	Widowed	30.8***	51.1***	13.4	4.6
	Never married	17.3**	67.5***	10.5***	4.8**
Race:	*White*	18.9	64.5	13.1***	3.5***
	Black	26.0***	57.8***	10.6**	5.6***
	Asian	11.7***	71.4***	11.6	5.3*
	Other	14.9***	69.7***	12.1	3.3
Ethnicity	*Latino*	15.2***	70.9***	10.2***	3.6
	Non-Latino	19.4***	63.8***	12.9***	3.9
Urbanicity:	*Urban*	16.4***	66.3**	12.3	5.0***
	Suburban	18.6	64.8	13.1*	3.4**
	Rural	27.2***	59.9***	10.8**	2.1***
Income:	*<$25,000*	31.5***	55.7***	9.1***	3.8
	$25,000–$49,999	25.1***	60.0***	10.9**	4.0
	$50,000–$74,999	18.5	64.2	13.2	4.0
	$75,000–$99,999	17.8	64.3	13.4	4.5
	>$100,000	13.2***	69.5***	13.7***	3.7
Employment status:	*Employed*	14.8***	68.3***	12.8	4.1
	Unemployed	23.9**	64.7	4.8***	6.6**
	Retired	27.8***	55.1***	14.3***	2.8***
	Other	24.1***	61.2***	11.0*	3.6
FICO score:	*<600*	28.2***	58.2***	9.2***	4.4
	600–649	20.2	66.3	9.3***	4.3
	650–699	17.1	66.1	12.9	3.9
	700–749	14.3***	68.5***	13.3	3.9
	750–799	16.3***	67.1***	12.0	4.5*
	> 800	18.5	62.9***	15.5***	3.2***
	Unknown	30.3***	59.3***	6.8***	3.6
Bankrupt in past year?	*Yes*	13.7***	68.5	13.5	4.4
	No	19.0***	64.6	12.5	3.9
Home ownership:	*Homeowner*	18.3**	64.1**	14.3***	3.3***
	Non-homeowner	20.0**	66.2**	8.8***	5.0***

Source: Authors' calculations based on the 2023 Survey and Diary of Consumer Payment Choice.
Note: Results are weighted using the nationally representative weights. "Other methods" include mobile payment apps, account-to-account transfers, income deductions, and methods that could not be classified in one of the other categories. Asterisks indicate results of a test of difference in means between the share of transactions using a payment instrument for members of a demographic group and the share of transactions using that method among respondents not in the demographic group; * p<0.10, ** p<0.05, *** p<0.01.

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Table 8: Percentage of transactions made using payment instruments

		% of all transactions using…						
		Cash	Check	Debit card	Credit card	Prepaid card	OBBP[a]	BANP[b]
All individuals		16.0	2.7	29.8	32.4	2.6	5.3	7.2
Age:	*<25*	13.7	1.9	31.4	32.4	5.9***	3.5*	6.3
	25–34	10.6***	1.5***	32.7***	36.0***	2.3	3.9***	7.5
	35–44	12.6***	1.1***	33.2***	36.8***	2.4	3.3***	7.6
	45–54	12.4***	1.7***	33.5***	31.9	3.9***	5.8	7.3
	55–64	20.6***	3.5**	31.0	24.0***	2.8	6.9***	7.0
	65+	23.9***	5.5***	20.2***	31.7	1.2***	7.4***	6.7
Highest education:	*No high school*	28.8***	1.3**	43.3***	7.9***	8.8***	1.8***	3.7***
	High school	22.2***	3.4**	39.0***	18.1***	2.5	4.6*	6.6
	Some college	17.1	3.1	37.8***	21.8***	3.2*	6.5**	6.4
	College graduate	13.0***	2.6	25.1***	39.5***	1.8***	6.0**	7.5
	Graduate school	10.3***	1.9***	17.8***	50.6***	2.1	4.9	8.7***
Gender:	*Female*	15.5	2.8	32.6***	29.5***	2.8	4.9**	7.4
	Male	16.6	2.6	26.8***	35.6***	2.3	5.8**	7.0
Marital status:	*Married*	14.5***	3.0**	27.9***	36.2***	1.9***	6.0***	7.1
	Divorced/Separated	20.0***	3.0	35.6***	21.0***	2.3	5.6	7.8
	Widowed	23.4***	7.2***	26.4*	23.2***	1.5**	6.2	7.2
	Never married	16.1	1.1***	31.6**	31.3	4.6***	3.5***	7.0
Race:	*White*	15.8	3.1***	29.4	32.7	2.4	5.7***	7.4
	Black	23.5***	1.6***	41.4***	13.9***	2.6	4.2*	6.3
	Asian	9.3***	2.4	11.0***	56.4***	4.1**	5.0	6.6
	Other	13.5**	1.5***	36.1***	31.6	2.0	4.5	7.6
Ethnicity	*Latino*	14.3*	0.9***	38.8***	28.6***	3.5*	3.5***	6.7
	Non-Latino	16.3*	3.0***	28.4***	33.0***	2.4*	5.6***	7.3
Urbanicity:	*Urban*	14.4***	1.9***	24.9***	37.5***	3.8***	5.5	6.8
	Suburban	15.8	2.7	32.3***	30.8***	1.7***	5.5	7.7**
	Rural	21.9***	5.3***	35.4***	22.7***	1.9**	4.4*	6.4
Income:	*<$25,000*	27.3***	3.4*	37.0***	14.8***	3.9***	4.9	4.2***
	$25,000–$49,999	21.9***	3.1	35.9***	22.1***	2.1	4.1***	6.8
	$50,000–$74,999	15.6	2.9	34.6***	27.4***	2.2	6.5**	6.7
	$75,000–$99,999	15.4	2.4	30.9	30.1*	3.3	5.6	7.9
	>$100,000	10.8***	2.4**	23.7***	43.6***	2.2**	5.4	8.3***
Employment status:	*Employed*	12.7***	2.1***	31.5***	34.3***	2.5	5.0**	7.8***
	Unemployed	21.7***	1.6	33.9	25.7***	5.1**	3.7	1.1***
	Retired	22.7***	5.1***	19.1***	34.5**	1.5***	7.8***	6.6
	Other	21.0***	2.7	35.1***	22.6***	3.5**	4.2**	6.9
FICO score:	*< 600*	27.1***	1.1***	46.9***	7.4***	4.0**	3.7***	5.5**
	600–649	18.2	1.3***	53.5***	7.9***	5.0***	3.4***	5.8*
	650–699	14.4	2.6	43.5***	20.7***	1.9	5.3	7.6
	700–749	12.7***	1.6***	33.2***	32.5	2.7	4.9	8.4**
	750–799	13.1***	3.2	26.2***	39.1***	1.8***	5.6	6.5
	> 800	14.7**	3.8***	14.2***	47.2***	1.5***	7.2***	8.2***
	Unknown	27.1***	2.7	36.8***	16.7***	5.8***	1.7***	5.1**
Bankrupt in past year?	*Yes*	12.9*	0.7***	48.3***	17.1***	3.1	5.5	8.0
	No	16.1*	2.8***	29.2***	32.9***	2.6	5.3	7.2
Home ownership:	*Homeowner*	15.1***	3.2***	26.9***	35.3***	1.9***	6.4***	8.0***
	Non-homeowner	17.9***	1.7***	35.7***	26.4***	4.0***	3.2***	5.6***

Source: Authors' calculations based on the 2023 Survey and Diary of Consumer Payment Choice.
Note: Results are weighted using the nationally representative weights. Rows do not add up to 100 percent because less frequently used payment instruments and those left unclassified are omitted. Asterisks indicate results of a test of difference in means between the share of transactions using a payment instrument for members of a demographic group and the share of transactions using that method among respondents not in the demographic group; * p<0.10, ** p<0.05, *** p<0.01.
[a] Online banking bill payment.
[b] Bank account number payment.

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Table 9: Heckman second-stage (OLS) regression results, estimated effects of demographics and subjective ratings on share of transactions made using a payment instrument, conditional on adoption

		Estimated effect on percent of payments made using…							
		Checks	Debit Card	Credit Card	Prepaid Card	OBBP[b]	BANP[c]	Mobile Apps[d]	Cash[a]
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Relative[d] rating of method:	*Cost*	-0.43	4.85*	9.64***	0.66	0.80	3.13	0.78	2.39
	Convenience	3.86***	8.78***	11.01***	2.84***	1.37	-0.06	0.81	8.05***
	Security	0.99	2.84*	7.09***	-0.12	1.13	0.01	0.26	2.42***
	Records	2.51**	-1.22	1.56	0.85	0.64	-0.81	-0.13	4.14***
	Speed	0.29	-2.58	6.72**	-1.79	0.88	0.15	0.02	2.10
Age:	*< 25*	-0.75	-0.57	15.31***	0.07	0.12	-0.51	0.58	-10.89***
	25–34	-1.06	-2.94	13.60***	1.06	-2.99	-0.48	-0.20	-10.07***
	35–44	-1.69	0.42	9.20***	1.70	-3.02*	-0.57	-0.63	-5.16***
	45–54	-2.01**	1.01	5.50**	2.66**	-1.76	-1.13	-0.39	-4.38**
	55–64	-1.53*	0.49	3.44	1.28	0.63	-0.99	-0.20	-1.89
	65+	--	--	--	--	--	--	--	--
Highest education:	*No high school*	-1.56	23.78***	-18.91***	3.61*	-5.08	-5.30	1.01	10.76***
	High school	0.68	12.31***	-15.42***	0.88	1.53	-1.25	0.03	8.43***
	Some college	2.16**	12.68***	-13.02***	1.45	3.29**	-1.98	0.19	2.66*
	College graduate	0.18	5.96***	-5.79***	0.69	0.82	-1.61	0.32	1.66
	Graduate school	--	--	--	--	--	--	--	--
Gender:	*Female*	--	--	--	--	--	--	--	--
	Male	-1.59***	-3.14**	4.49***	0.52	1.30	-1.31	-0.74**	1.59
Marital status:	*Married*	1.49*	3.68**	-1.87	-1.94**	-0.29	-0.96	-0.02	-1.23
	Divorced/Separated	-0.25	1.32	-3.06	-0.65	1.31	-0.14	0.15	0.66
	Widowed	4.72***	-1.39	-5.86*	-1.20	0.36	2.31	-0.78	-0.82
	Never married	--	--	--	--	--	--	--	--
Race:	*White*	--	--	--	--	--	--	--	--
	Black	0.05	4.19**	-6.67***	-0.60	-2.66*	-0.92	0.82*	3.74**
	Asian	-1.32	-13.60***	11.79***	3.20***	0.66	-0.76	-0.18	-1.58
	Other	-0.11	4.38*	-3.19	-0.58	-1.05	-1.20	-0.09	-0.46
Ethnicity:	*Latino*	-1.24	1.34	-0.12	0.21	0.28	0.36	0.14	-1.52
	Non-Latino	--	--	--	--	--	--	--	--
Income:	*<$25,000*	2.91***	2.51	-5.40**	1.58*	0.70	-1.54	-0.11	7.98***
	$25,000–$49,999	2.81***	2.04	-4.23**	-1.13	0.99	-1.60	0.40	3.42**
	$50,000–$74,999	0.86	4.68**	-3.20*	-0.74	2.55**	-0.77	0.43	-0.13
	$75,000–$99,999	0.43	3.74*	-4.21**	-0.49	1.25	-0.42	-0.36	2.99*
	>$100,000	--	--	--	--	--	--	--	--
Employment status:	*Employed*	--	--	--	--	--	--	--	--
	Unemployed	-1.15	5.63	1.41	2.54*	0.34	-4.99	1.18	4.62*
	Retired	-0.69	-10.13***	10.50***	1.09	-0.90	-1.75	-0.82	1.36
	Other	-0.46	-4.80**	4.63**	2.36***	-0.26	-0.62	0.07	3.14**
FICO score:	*<600*	-2.31	22.70***	-22.88***	2.08	-0.63	0.20	0.98	8.24***
	600–649	-2.73**	23.42***	-21.39***	1.26	1.83	3.99**	-0.03	1.68
	650–699	-0.78	18.59***	-14.17***	-1.58	0.71	2.01	-0.55	-1.30
	700–749	-1.49*	13.27***	-10.33***	-0.06	0.50	1.58	-0.18	-2.66*
	750–799	-0.31	8.36***	-6.13***	-0.84	1.11	0.91	-0.50	-1.17
	>800	--	--	--	--	--	--	--	--
	Unknown	-0.29	18.58***	-9.94***	3.15***	-0.95	7.51***	0.89	6.37***
Home ownership:	*Homeowner*	-0.12	-0.48	0.49	-0.29	3.26***	1.83	0.55	-3.19**
	Non-homeowner	--	--	--	--	--	--	--	--
Inverse Mills ratio		-0.98	-11.25	-3.26	-2.32	-1.61	-5.67	0.03	--
	Constant	5.56***	11.94***	38.57***	3.23	4.02	14.82***	0.78	20.27***
	Observations	2,896	3,305	3,152	2,519	2,215	1,812	2,508	3,659
	Adjusted-R^2	0.0520	0.1525	0.2140	0.0427	0.0174	0.0119	0.0071	0.1228
Adjusted-R^2 without ratings		0.0342	0.1448	0.1783	0.0364	0.0172	0.0066	0.0062	0.0995

Source: Authors' calculations based on the 2023 Survey and Diary of Consumer Payment Choice.

Note: "--" denotes the reference group for categorical variables. * p<0.10, ** p<0.05, *** p<0.01. These regressions exclude the variables indicating whether a respondent is urban/rural, whether the respondent has declared bankruptcy in the past year, the number of residents in the respondent's household, and how the respondent rates the payment instrument with regard to acceptance/setting up, all of which are present in the preceding table.

[a] Correction term not included (8), since no adoption regression was estimated for cash.

[b] Online banking bill payment.

[c] Bank account number payment.

[d] Any mobile payment app, including (but not limited to) PayPal, Venmo, and Zelle.

[e] Calculated as the log of a rating divided by the rating of another instrument, averaged over all other instruments.

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Table 10: Adoption of mobile payment apps

		% of each demographic adopting…					
		Any mobile payment app	PayPal	Venmo	Zelle	Cash App	Other mobile payment method
All individuals		71.8	35.2	32.5	27.9	20.3	31.8
Age:	*<25*	92.5***	32.2	58.3***	42.7***	27.1	54.4***
	25–34	85.6***	37.6	49.8***	38.2***	28.1***	47.8***
	35–44	83.3***	42.4***	41.2***	32.8**	27.5***	39.1***
	45–54	75.0	37.9	33.5	28.1	21.5	32.4
	55–64	61.2***	33.6	21.2***	20.6***	15.2***	19.0***
	65+	49.5***	27.5***	9.8***	15.5***	8.2***	13.5***
Highest education:	*No high school*	53.8***	15.6***	9.1***	11.0***	29.4**	25.0*
	High school	60.4***	27.7***	15.4***	17.6***	23.2**	23.7***
	Some college	71.6	38.2	26.9***	28.5	24.1**	33.4
	College graduate	78.3***	39.2***	44.4***	32.5***	16.4***	33.5
	Graduate school	88.7***	46.8***	57.6***	44.9***	14.8***	45.0***
Gender:	*Female*	75.4***	36.1	34.1*	31.1***	21.9*	34.3***
	Male	68.1***	34.3	30.9*	24.7***	18.6*	29.2***
Marital status:	*Married*	70.6	37.2**	32.4	26.3*	15.0***	28.1***
	Divorced/Separated	64.7***	31.7	20.7***	21.0***	25.9**	24.8***
	Widowed	50.5***	26.7**	6.1***	22.6	12.9**	17.0***
	Never married	81.5***	34.4	43.2***	35.5***	29.5***	45.3***
Race:	*White*	68.7***	35.4	33.5	21.3***	14.8***	28.1***
	Black	74.6	27.7***	12.9***	40.0***	53.4***	35.9
	Asian	88.9***	50.3***	54.5***	58.5***	8.0***	45.1***
	Other	77.4*	32.1	33.2	33.8*	26.0*	42.1***
Ethnicity	*Latino*	87.5***	30.1*	36.8	50.2***	32.2***	47.7***
	Non-Latino	69.8***	35.9*	31.9	25.0***	18.7***	29.7***
Urbanicity:	*Urban*	82.1***	37.8*	42.8***	43.3***	23.4**	42.0***
	Suburban	71.7	34.7	31.3	23.9***	21.2	30.0*
	Rural	50.4***	31.3*	14.3***	7.8***	11.1***	15.7***
Income:	*<$25,000*	62.8***	25.4***	15.9***	20.1***	31.5***	27.0***
	$25,000–$49,999	63.6***	30.7**	19.6***	19.5***	22.9	27.1**
	$50,000–$74,999	68.3	38.5	27.5**	26.9	19.0	30.9
	$75,000–$99,999	72.3	34.1	32.0	30.3	15.9**	32.9
	> $100,000	82.0***	41.9***	49.8***	35.8***	14.6***	36.7***
Employment status:	*Employed*	80.6***	38.8***	43.2***	33.7***	23.0***	38.0***
	Unemployed	75.1	38.9	26.7	32.5	30.3**	36.0
	Retired	49.3***	27.3***	11.0***	16.5***	7.0***	14.7***
	Other	64.9***	30.4**	20.7***	19.0***	21.9	27.6**
FICO score:	*< 600*	72.1	30.2*	16.7***	23.7	49.0***	34.8
	600–649	75.8	33.7	18.9***	29.4	33.2***	37.4*
	650–699	72.2	32.3	29.7	29.6	21.8	32.7
	700–749	75.8*	37.7	38.9***	31.6	20.9	34.0
	750–799	77.7***	36.5	43.3***	30.2	13.5***	36.2**
	>800	68.7**	41.9***	36.2**	29.4	8.8***	27.3***
	Unknown	56.5***	21.2***	20.6***	15.4***	22.2	20.9***
Bankrupt in past year?	*Yes*	80.8*	44.0	29.8	33.0	41.3***	46.3**
	No	71.5*	34.9	32.6	27.8	19.7***	31.3**
Home ownership:	*Homeowner*	68.3***	37.4***	29.9***	24.8***	14.7***	27.8***
	Non-homeowner	77.7***	31.4***	36.8***	33.2***	29.7***	38.4***

Source: Authors' calculations based on the 2023 Survey and Diary of Consumer Payment Choice.
Note: Results are weighted using the nationally representative weights. Asterisks indicate results of a test of difference in means between the rate of adoption for a demographic group and rate of adoption for observations outside that demographic group; * p<0.10, ** p<0.05, *** p<0.01.

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Table 11: Use of buy now, pay later (BNPL)

		% of each demographic who…	
		Have used BNPL in past 30 days	Have used BNPL more than once in past 30 days
All individuals		9.3	3.9
Age:	*< 25*	6.7	2.1*
	25–34	11.2	4.7
	35–44	11.3	6.0**
	45–54	9.6	3.9
	55–64	8.9	3.9
	65+	6.6***	2.2***
Highest education:	*No high school*	8.3	2.4
	High school	11.1*	4.8
	Some college	11.0	4.4
	College graduate	7.7*	3.2
	Graduate school	6.9**	3.5
Gender:	*Female*	11.6***	5.7***
	Male	6.9***	2.1***
Marital status:	*Married*	8.9	3.3*
	Divorced/Separated	9.1	4.1
	Widowed	7.8	4.1
	Never married	10.3	5.2*
Race:	*White*	8.4**	3.3**
	Black	15.1***	7.0**
	Asian	4.7***	2.2
	Other	11.7	6.0
Ethnicity	*Latino*	16.4***	7.8**
	Non-Latino	8.3***	3.4**
Urbanicity:	*Urban*	7.7*	3.8
	Suburban	9.8	4.1
	Rural	10.9	3.8
Income:	*<$25,000*	10.8	5.1
	$25,000–$49,999	11.1	3.2
	$50,000–$74,999	13.6**	5.1
	$75,000–$99,999	9.2	6.2*
	>$100,000	5.8***	2.4***
Employment status:	*Employed*	9.8	4.1
	Unemployed	8.2	5.7
	Retired	6.9**	2.5**
	Other	10.3	4.4
FICO score:	*<600*	23.0***	13.0***
	600–649	21.6***	11.8***
	650–699	13.3**	5.0
	700–749	11.0	2.9
	750–799	4.8***	1.5***
	> 800	2.8***	0.8***
	Unknown	4.4***	1.9***
Bankrupt in past year?	*Yes*	23.4***	8.2
	No	8.8***	3.8
Home ownership:	*Homeowner*	8.4*	3.4*
	Non-homeowner	10.7*	4.9*

Source: Authors' calculations based on the 2023 Survey and Diary of Consumer Payment Choice.
Note: Results are weighted using the nationally representative weights. Asterisks indicate results of a test of difference in means between the rate of adoption for a demographic group and rate of adoption for observations outside that demographic group; * p<0.10, ** p<0.05, *** p<0.01.

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Table 12: Probit regression results, estimated effects of demographics on BNPL adoption

		Effect on percentage point chance of adopting BNPL[a]	
		(1)	(2)
Age:	*<25*	-0.29	0.73
	25–34	0.63	-1.17
	35–44	3.24*	0.58
	45–54	0.81	-0.74
	55–64	2.15	0.89
	65+	--	--
Highest education:	*No high school*	-3.47*	-4.61***
	High school	0.43	-1.53
	Some college	1.13	-0.91
	College graduate	-0.88	-1.17
	Graduate school	--	--
Gender:	*Female*	--	--
	Male	-4.54***	-3.65***
Marital status:	*Married*	0.79	0.67
	Divorced/Separated	-0.18	-0.88
	Widowed	-0.44	-1.19
	Never married	--	--
Race:	*White*	--	--
	Black	8.26***	4.39***
	Asian	-1.40	0.65
	Other	1.21	1.27
Ethnicity:	*Latino*	6.45***	5.71***
	Non-Latino	--	--
# of household residents		0.53**	0.20
Urbanicity	*Rural*	1.74	1.19
	Mixed	--	--
	Urban	-1.37	-0.77
Income:	*<$25,000*	2.85**	-0.32
	$25,000–$49,999	4.21***	1.48
	$50,000–$74,999	4.46***	2.14
	$75,000–$99,999	3.15**	1.62
	>$100,000	--	--
Employment status:	*Employed*	--	--
	Unemployed	-2.77*	-3.15**
	Retired	-2.56*	-1.00
	Other	-0.27	-0.44
FICO score:	*<600*		18.11***
	600–649		16.97***
	650–699		12.55***
	700–749		4.95***
	750–799		1.63*
	>800		--
	Unknown		1.24
Bankruptcy in past year		8.84**	5.20*
Home ownership:	*Homeowner*	-1.50	0.63
	Non-homeowner	--	--
	Observations	4,547	4,546
	Pseudo R^2	0.0658	0.1215

Source: Authors' calculations based on 2023 Survey and Diary of Consumer Payment Choice.
Note: Results shown are estimated marginal effects at means (for continuous variables) and of a discrete change relative to the reference group (for categorical variables). "--" denotes the reference group for categorical variables.
* p<0.10, ** p<0.05, *** p<0.01.
[a] Buy now, pay later adoption is defined as use in the past 30 days.

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Table 13: Probit regression results, estimated effects of demographics on cryptocurrency adoption

		Estimated percentage point effect on the probability of adopting cryptocurrency	
		(1)	(2)
Age:	*< 25*	3.99*	3.58
	25–34	5.13***	4.85***
	35–44	7.70***	7.68***
	45–54	2.05**	1.98**
	55–64	2.15**	2.09**
	65+	--	--
Highest education:	*No high school*	-2.61**	-2.33**
	High school	-0.96	-0.70
	Some college	2.04**	2.24**
	College graduate	2.39***	2.30***
	Graduate school	--	--
Gender:	*Female*	--	--
	Male	5.76***	5.65***
Marital status:	*Married*	-0.68	-0.80
	Divorced/Separated	-1.22	-1.29
	Widowed	-0.22	-0.36
	Never married	--	--
Race:	*White*	--	--
	Black	1.04	1.35
	Asian	3.18**	3.00**
	Other	-0.57	-0.51
Ethnicity:	*Latino*	0.74	0.64
	Non-Latino	--	--
# of household residents		-0.09	-0.07
Urbanicity	*Rural*	-1.49*	-1.45*
	Mixed	--	--
	Urban	2.70***	2.58***
Income:	*< $25,000*	-2.70***	-2.26**
	$25,000–$49,999	-1.81	-1.62
	$50,000–$74,999	-1.66	-1.51
	$75,000–$99,999	-3.48***	-3.33***
	>$100,000	--	--
Employment status:	*Employed*	--	--
	Unemployed	0.32	0.75
	Retired	-3.00***	-2.98***
	Other	-0.51	-0.31
FICO score:	*<600*		-1.53
	600–649		-0.56
	650–699		0.60
	700–749		0.43
	750–799		1.42
	>800		--
	Unknown		-1.58
Bankruptcy in past year		1.66	2.02
Home ownership:	*Homeowner*	0.90	0.71
	Non-homeowner	--	--
	Observations	4,547	4,546
	Pseudo R^2	0.1274	0.1311

Source: Authors' calculations based on 2023 Survey and Diary of Consumer Payment Choice.
Note: Results shown are estimated marginal effects at means (for continuous variables) and of a discrete change relative to the reference group (for categorical variables). "--" denotes the reference group for categorical variables.
* p<0.10, ** p<0.05, *** p<0.01.

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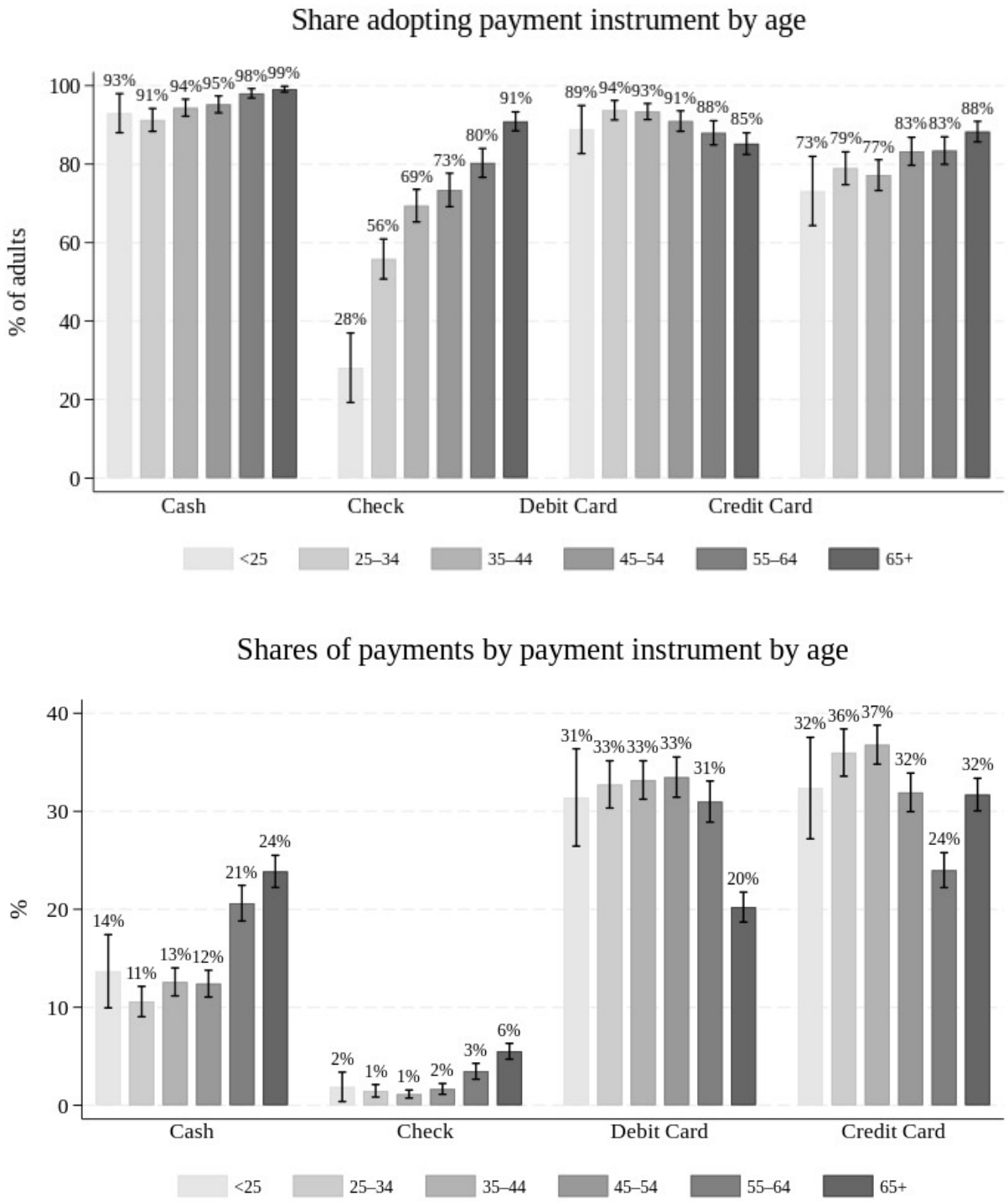
Figure 1: Adoption and use of payment instruments by age



Source: Authors' calculations based on the 2023 Survey and Diary of Consumer Payment Choice.

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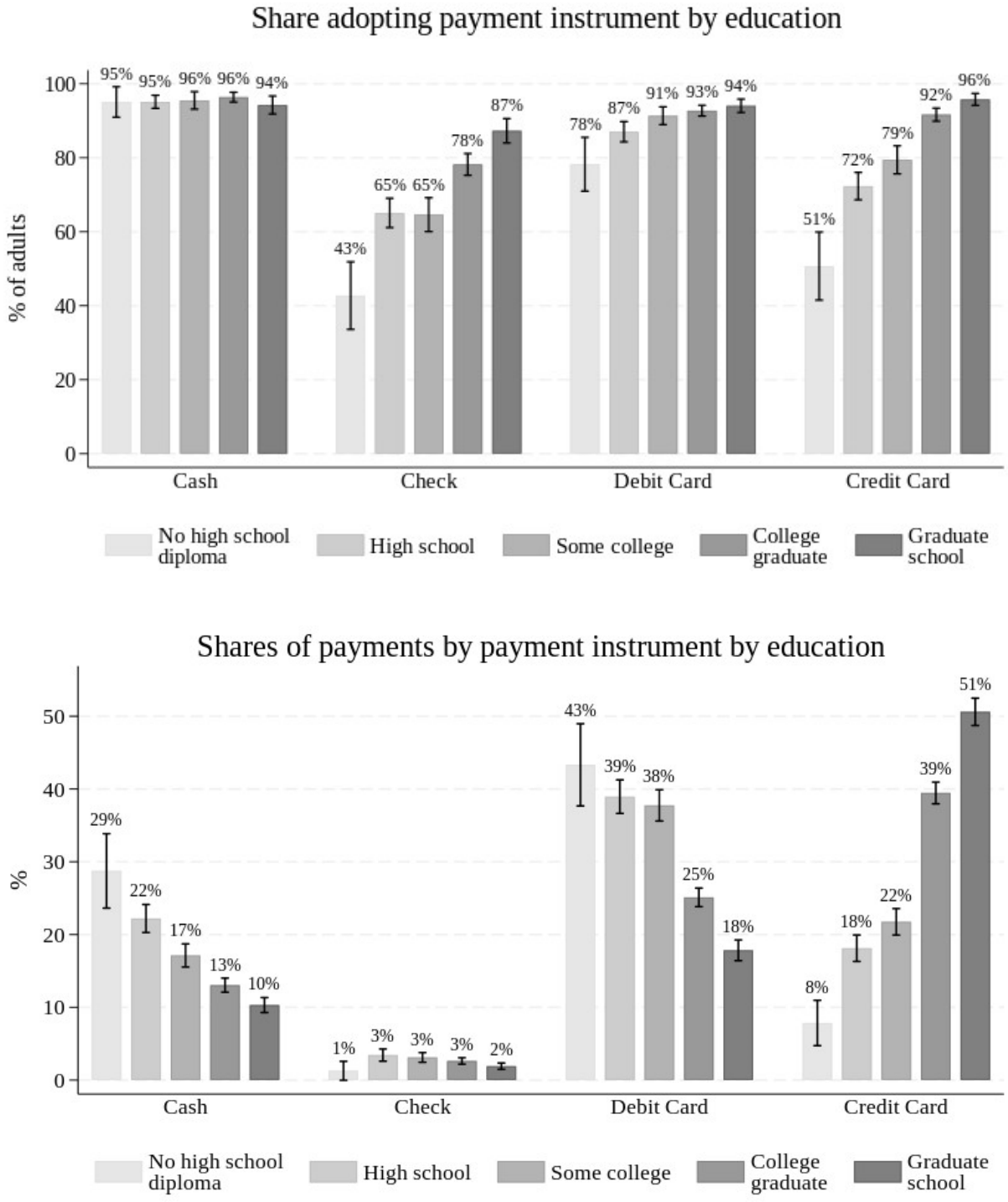
Figure 2: Adoption and use of payment instruments by education



Source: Authors' calculations based on the 2023 Survey and Diary of Consumer Payment Choice. 95% confidence intervals shown.

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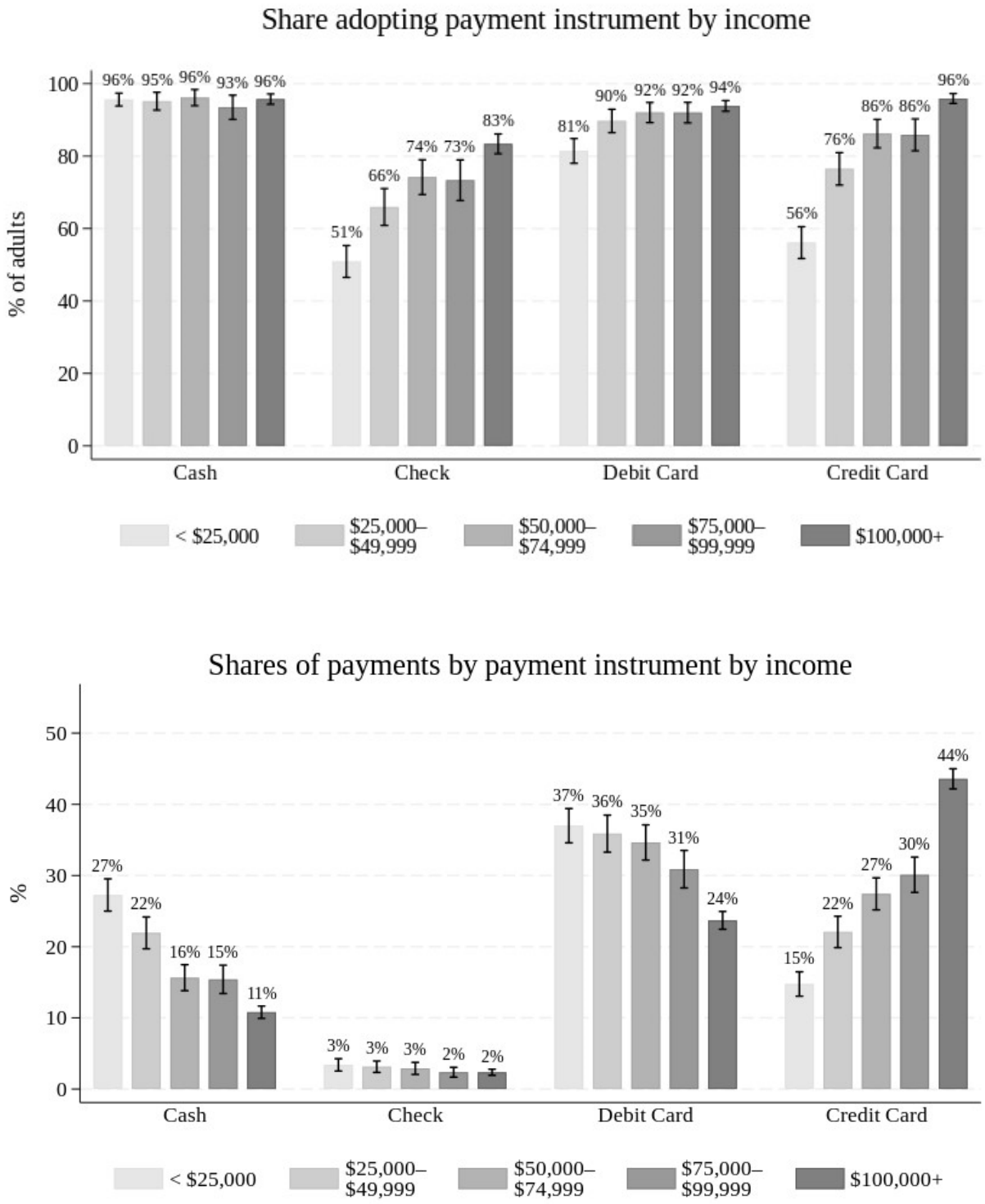
Figure 3: Adoption and use of payment instruments by income



Source: Authors' calculations based on the 2023 Survey and Diary of Consumer Payment Choice. 95% confidence intervals shown.

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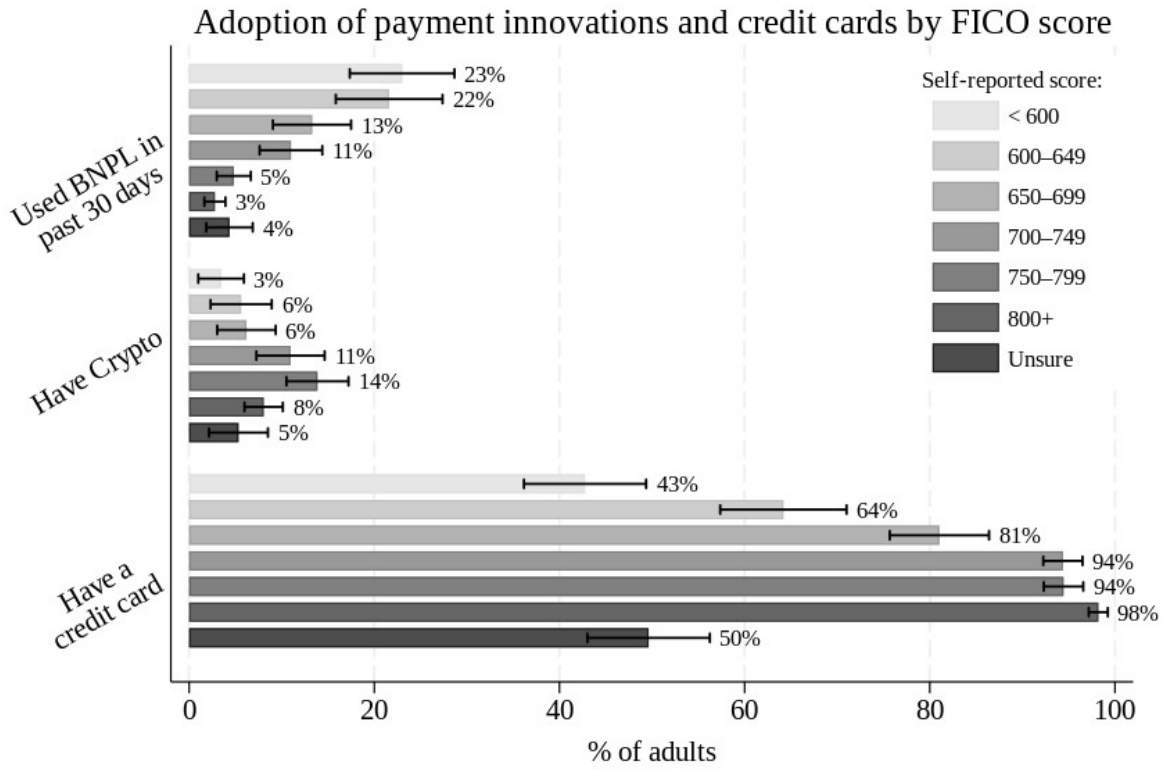
Figure 4: Adoption of payment innovations and credit cards by FICO score



Source: Authors' calculations based on the 2023 Survey and Diary of Consumer Payment Choice. 95% confidence intervals shown.

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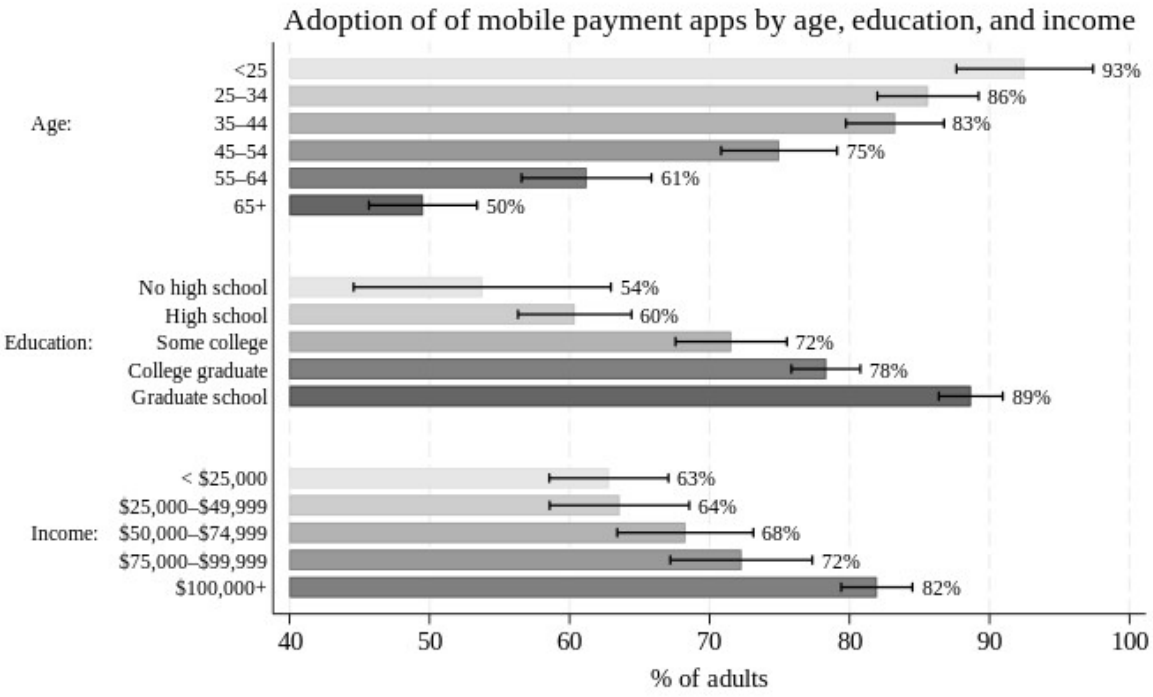
Figure 5: Adoption of mobile payment apps by age, education, and income



Source: Authors' calculations based on the 2023 Survey and Diary of Consumer Payment Choice.

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Appendix

The 2023 Survey and Diary of Consumer Payment Choice asked participants to rate payment instruments according to several characteristics. They were asked to rate eight payment instruments according to seven characteristics on a scale of 1 to 5.

The payment instruments are:

- Cash
- Check
- Money order
- Debit card
- Prepaid card
- Bank account number payment
- Online banking bill pay
- Mobile payments such as Venmo or Zelle

The characteristics were presented in a random order and were defined as follows:

a. Suppose a payment method has been stolen, misused, or accessed without the owner's permission. Please rate the **SECURITY** of each method against permanent financial loss or unwanted disclosure of personal information.
   1. Very risky
   2. Risky
   3. Neither risky nor secure
   4. Secure
   5. Very secure

b. Please rate how likely each payment method is to be **ACCEPTED** for payment by stores, companies, online merchants, and other people or organizations.
   1. Rarely accepted
   2. Occasionally accepted
   3. Often accepted
   4. Usually accepted
   5. Almost always accepted

c. Please rate the **COST** of using each payment method.
   Examples: Fees, penalties, postage, interest paid or lost, subscriptions, or materials can raise the cost of a payment method. Cash discounts and rewards (like frequent flyer miles) can lower the cost of a payment method.
   - *Consider the cost of using or owning the payment method, not the cost of an item purchased.*

   1. Very high cost

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2. High cost
3. Neither high nor low cost
4. Low cost
5. Very low cost

d. Please rate the **CONVENIENCE** of each payment method.
   Examples: speed, control over payment timing, ease of use, effort to carry, ability to keep or store.
   1. Very inconvenient
   2. Inconvenient
   3. Neither inconvenient nor convenient
   4. Convenient
   5. Very convenient

e. Rate the task of **GETTING OR SETTING UP** each payment method before you can use it.
   Examples: getting cash at the ATM, length of time to get or set up, paperwork, learning to use or install it, or travel.
   1. Very hard to get or set up
   2. Hard to get or set up
   3. Neither hard nor easy
   4. Easy to get or set up
   5. Very easy to get or set up

f. Rate the quality of **PAYMENT RECORDS** offered by each payment method. Consider both paper and electronic records.
   Examples: proof of purchase, account balances, spending history, usefulness in correcting errors or dispute resolution, or ease of storage.
   1. Very poor records
   2. Poor records
   3. Neither good nor poor
   4. Good records
   5. Very good records

g. Rate the **SPEED** of each payment method during a payment transaction. Examples of speed include the time spent at the payment counter or the time spent on a website's checkout page.
   Do **not** include delays unrelated to the actual use of the payment, such as waiting in line.
   1. Very poor records
   2. Poor records
   3. Neither good nor poor
   4. Good records
   5. Very good records

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Following Schuh and Stavins (2010, 2013), we convert the characteristics ratings to relative characteristics using the following transformation:

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

where k indexes the characteristics (k = cost, acceptance, convenience, security, setup, record keeping, and speed), i indexes the consumer, j is the payment instrument in question, and j' is every other payment instrument besides j. For our baseline specification, we construct the average relative characteristic for each payment characteristic k:

$$\overline{RCHAR}_{ki}(j) \equiv \frac{1}{\tilde{J}_i} \sum_{j' \neq j} RCHAR_{ki}(j,j'),$$

over all $\tilde{J}_i$ payment instruments for consumer i. For example, $\overline{RCHAR}_{ki}(j)$ for k = cost and j = debit card is the average of the log ratios of debit card cost to the cost of each of the other payment instruments for consumer i. A high value of the variable would indicate that the consumer considers debit cards to be relatively less costly (more desirable) compared with the other payment methods (a higher rating indicates a better outcome). Note that we construct the characteristics relative to *all* payment instruments, regardless of whether the consumer has adopted them.

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