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FEDERAL RESERVE BANK *of* KANSAS CITY



# Financial Literacy, Risk Tolerance, and Cryptocurrency Ownership in the United States

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## Abstract

Cryptocurrency owners without sufficient financial literacy and risk tolerance may be financially vulnerable, as the cryptocurrency market is highly volatile and lacks consumer protections. Our study divides cryptocurrency owners into three groups based on their purpose for holding cryptocurrencies—for investment only (investors), for transactions only (transactors), and for a mix of investment and transactions (mix users)—and examines how each group correlates with financial literacy and risk tolerance compared to consumers who do not own cryptocurrencies (nonowners). Using the 2022 Survey of Household Economics and Decisionmaking, we find that investors and mix users are significantly or moderately more financially literate and risk tolerant than nonowners, but transactors are less financially literate and slightly more risk tolerant than nonowners. We also find that the three groups of cryptocurrency owners vary by demographic and financial characteristics. Our findings highlight that transactors could be particularly financially vulnerable in the absence of consumer protections in the cryptocurrency market.

Keywords: Cryptocurrency, investment, transactions, financial literacy, risk tolerance

JEL Codes: D14, D91, E42.

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## 1. Introduction

In 2022, about 10-20% of U.S. adults are reported to own cryptocurrencies, such as Bitcoin and Ethereum (Franck 2022; PYMNTS and BitPay 2022; Board of Governors of the Federal Reserve System 2023; Faverio and Sidoti 2023; Foster, Greene and Stavins 2023). The original intent of cryptocurrencies was for transactions, as substitutes for existing payment methods, but today, they are more popular as an investment tool than for transactions in the United States. According to the 2022 Survey of Household Economics and Decisionmaking (SHED), over 80% of cryptocurrency owners own them for investment and about 30% use them for transactions.

Ownership of cryptocurrencies involves risks not only for investment but also for transactions. The risks in cryptocurrency investment include high volatility of their prices and lack of regulation by any central authority. For instance, the most recent “crypto winter” (a downturn in the cryptocurrency market) in 2022 saw extensive collapses in cryptocurrency prices with about \$2 trillion loss in market value (Akana 2023), and a large share of U.S. cryptocurrency owners lost money from the investment during that time (Evan et al. 2023). The risks involved in transactions with cryptocurrency include loss of funds due to lack of consumer protections against fraud, lost private keys, bankruptcy of cryptocurrency exchanges or wallet providers, and high and ambiguous fees for making transactions. For instance, cash-to-cryptocurrency Bitcoin ATMs (commonly called BTMs) do not require identification for operation, exposing both consumers and operators to the risk of fraudulent practices (Thomson Reuters Institute 2022). Multiple fees are also assessed for a BTM transaction and the total fee of 20% of the transaction value is common (Noll 2023). While cryptocurrency owners with sufficient financial literacy and appropriate risk tolerance may be able to avoid or mitigate the potential harms of cryptocurrency, those lacking sufficient financial literacy or having inappropriate risk appetite may not be equipped to weather the risks involved.

Policymakers are concerned about these potential risks of cryptocurrencies for consumers. Several bills have been introduced in Congress, a few of which have garnered attention and are currently awaiting action. Some bills aim to build regulatory frameworks surrounding digital assets, including cryptocurrencies, and define regulatory jurisdiction of

cryptocurrencies for investment.<sup>1</sup> Other bills focus on cryptocurrency transactions, calling for greater attention regarding identification of BTM users, recipients, and their locations.<sup>2</sup> At the state level, several states have introduced or passed laws concerning cryptocurrency business activities (Jasperse 2022). For example, the states of California and New York require entities to obtain a license for conducting digital financial asset (or virtual currency) business activities (Cooley 2023). Further, the state of California imposes requirements on operations of BTMs, including a \$1,000 daily transaction limit per customer; disclosures of the terms and conditions, the listed price of the cryptocurrency transacted, and the amount of various fees and charges; and the cap of the total fees and charges at no greater than \$5 or 15% of the transaction value (Cooley 2023).

Given the high price volatility and lack of consumer protections in the cryptocurrency market, cryptocurrency owners without sufficient financial literacy and risk tolerance may be financially vulnerable. Research on how financial literacy and risk tolerance are associated with cryptocurrency ownership is growing, but the findings tend to be mixed, especially those concerning the relationship between financial literacy and cryptocurrency ownership. Existing studies tend to find a negative relationship between objective financial literacy (which refers to the actual knowledge of the consumer) and cryptocurrency ownership or investment (Huynh et al. 2020; Kim et al. 2020; Panos et al. 2021; Zhao and Zhang 2021), while they tend to find a positive relationship between subjective financial literacy (which refers to one's perceptions or confidence in financial literacy) and cryptocurrency ownership (Arias-Oliva et al. 2019; Zhao and Zhang 2021). Fujiki (2020), however, finds a positive relationship between objective financial literacy and cryptocurrency ownership using Japanese data, although cryptocurrency owners without experience in conventional risky assets tend to have lower objective financial literacy than both cryptocurrency owners and nonowners with experience. Tzavaras (2023) finds no significant relationship between financial literacy and cryptocurrency investment but finds a positive relationship between having cryptocurrency-related knowledge and intention to invest in cryptocurrency.

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<sup>1</sup> [S.2669](#): Digital Asset Anti-Money Laundering Act of 2023; [H.R. 4763](#): Financial Innovation and Technology for the 21<sup>st</sup> Century Act; [H.R. 4766](#): Clarity for Payment Stablecoins Act of 2023.

<sup>2</sup> [S.2281](#): Lummis-Gillibrand Responsible Financial Innovation Act and [S.2355](#): Crypto-Asset National Security Enhancement and Enforcement Act of 2023.

In contrast to the relationship between financial literacy and cryptocurrency ownership, existing studies generally find a positive relationship between risk tolerance and cryptocurrency ownership. Xi et al. (2020) and Zhao and Zhang (2021) find that individuals with a higher risk tolerance are relatively more willing to invest in cryptocurrency. Santoso and Modjo (2022) find most cryptocurrency investors in Indonesia are risk-lovers driven mainly by profit-seeking motives. Hackethal et al. (2022) find that cryptocurrency investors in Germany are particularly prone to investment biases and hold risky portfolios. Jia et al. (2021) find that under certain circumstances, cryptocurrency investors have lottery-like preferences: seeking cryptocurrencies with extremely high payoffs and are not threatened by market crash risk unlike stock investors. Similarly, Kogan et al. (2023) and Auer et al. (2023) find different behaviors between cryptocurrency investors and conventional asset investors.

Existing studies further find that some cryptocurrency owners are more likely to belong to vulnerable groups of the population. Faverio and Massarat (2022) find that U.S. adults of a racial minority (Black, Hispanic, or Asian) are more likely to hold cryptocurrency than their white counterparts. Lowrey (2022) reports that Black U.S. investors tend to come from a financially unstable footing and have made losses in the cryptocurrency market during the crypto winter in 2022. Zhao and Zhang (2021) report that the sizable share of U.S. cryptocurrency investors in their sample are consumers with a low household income (less than \$35,000).

In this study, we examine whether financial literacy and risk tolerance vary across different groups of cryptocurrency owners versus nonowners. It is possible that cryptocurrency owners, on average, have higher financial literacy and risk tolerance than nonowners, but if certain groups of cryptocurrency owners have lower financial literacy and risk tolerant than nonowners, those groups may be particularly financially vulnerable. We divide cryptocurrency owners into three groups based on their purpose—for investment only (investors), for transactions only (transactors), and for a mix of investment and transactions (mix users)—because different purposes of owning cryptocurrencies may be differently associated with financial literacy and risk tolerance. We also examine which demographic and financial characteristics are associated with the three groups of cryptocurrency owners. To this end, we use the 2022 SHED data and run a multinomial logit model. The SHED data provides a large sample of nationally representative US adults with detailed demographic and financial variables

as well as unique financial well-being variables such as credit access and ability to meet emergency expenses.

We find significant heterogeneity in objective financial literacy, risk tolerance, and other consumer characteristics across the three groups of cryptocurrency owners. Compared to nonowners, investors are significantly more financially literate and mix users are moderately more financially literate, but transactors are less financially literate, even after controlling for all other variables. Compared to nonowners, investors and mix users have significantly higher risk tolerance, while transactors have slightly higher risk tolerance. Compared to nonowners, all three types of owners tend to be male, be self-employed or work for family business, and use alternative financial services (AFS) as well as buy-now-pay-later (BNPL) services. Investors and mix users tend to be younger and moderately educated: high school or less is negatively associated with both groups, while bachelor's degree or higher is negatively associated with investors only. Investors tend to be high-income earners and have high demand for credit, but income and demand for credit have no association with mix users and transactors. Black and Hispanic consumers tend to be transactors or mix users but they have little association with investors. Finally, transactors tend to have a lower credit score.

Our study contributes to the existing literature on the relationship between cryptocurrency ownership and financial literacy or risk tolerance. Consistent with Fujiki (2020), but unlike several studies, we find a positive relationship between cryptocurrency investment and objective financial literacy. We also find a negative relationship between cryptocurrency transactors and objective financial literacy, suggesting whether cryptocurrency owners are more financially literate than nonowners depends on the type of owners. Additionally, we find risk tolerance to be significantly positively associated with cryptocurrency investment, which is consistent with most existing studies. Risk tolerance is also positively associated with cryptocurrency transactors, although the association is much weaker compared to that with investment.

Our study also contributes to the existing literature on demographic and financial characteristics of cryptocurrency owners. To the best of our knowledge, our study is the first to uncover additional characteristics that are highly associated with cryptocurrency investors, mix users, transactors, or overall owners. AFS use, BNPL use, and self-employment are strongly positively associated with all three types of owners. Black and Hispanic consumers' stronger

associations with transactors and mix users than those with investors, higher income being associated with investors only, and lower credit scores being associated with transactors only represent novel findings in the literature.

Our findings suggest that cryptocurrency transactors may be particularly financially vulnerable as they tend to be less financially literate, a racial minority, and having a lower credit score. These findings highlight areas for further research and discussion especially in the context of policy implications, such as the effects of enhancing consumer protections in the cryptocurrency market and the benefits of raising consumer awareness and education regarding the risks associated with cryptocurrency ownership, transactions, and investment.

The rest of the paper is organized as follows. Section 2 describes the data and explains our empirical methodology. Section 3 provides the results. Section 4 discusses policy implications of our results and Section 5 concludes.

## **2. Empirical analysis**

### ***2.1. Data***

We use the 2022 Survey of Household Economics and Decisionmaking (SHED) data for our analysis. The Federal Reserve Board manages and disseminates the SHED annually to monitor the financial circumstances of households in the United States, emphasizing how low- and middle-income individuals are faring. The SHED includes modules on various topics relevant to financial well-being, including credit access and behaviors, use of emerging financial services, savings, retirement, economic fragility, and student loans.

The 2022 SHED data consists of 11,667 respondents and the respondents are weighted to be nationally representative of U.S. adults. Nearly 10% (1,067) of the respondents are cryptocurrency owners. We divide cryptocurrency owners into three groups based on the purpose for ownership. Out of the 10% of respondents owning cryptocurrencies, about 7.3% of the respondents bought or held it exclusively for investment (we call them “investors”), 1.6% owned it exclusively for transactions such as for buying, making payments, or sending money to friends and family (“transactors”), and 1.1% of the respondents own cryptocurrency for both investment and transactions (“mix users”).

To assess respondents’ financial literacy, the SHED asks three questions about core financial concepts: interest, inflation, and risk diversification. Table 1 shows the actual questions

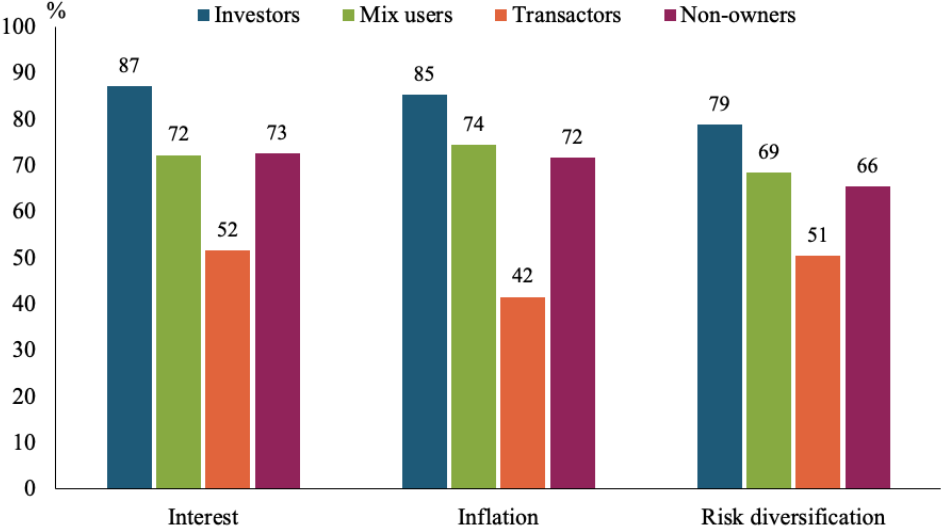
and answers to choose from in the SHED. Figure 1 shows the weighted shares of respondents who got a correct answer for each of the three questions by group of respondents: cryptocurrency investors, mix users, transactors, and nonowners. For all three questions, cryptocurrency investors have the highest shares of respondents who got a correct answer and transactors have the lowest shares. Mix users and nonowners are in-between.

**Table 1: Financial literacy questions asked in the SHED**

Interest	“Suppose you had \$100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow?” Choices - more than \$102, exactly \$102, less than \$102, or don’t know
Inflation	“Imagine the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, with the money in this account, would you be able to buy” Choices - more than today, less, equal to today, or don’t know
Risk diversification	“Buying a single company stock usually provides a safer return than a stock mutual fund” Choices - True or false

Source: Federal Reserve Board.

**Figure 1: Share of respondents correctly answering each financial literacy question by type of cryptocurrency owners and nonowners**



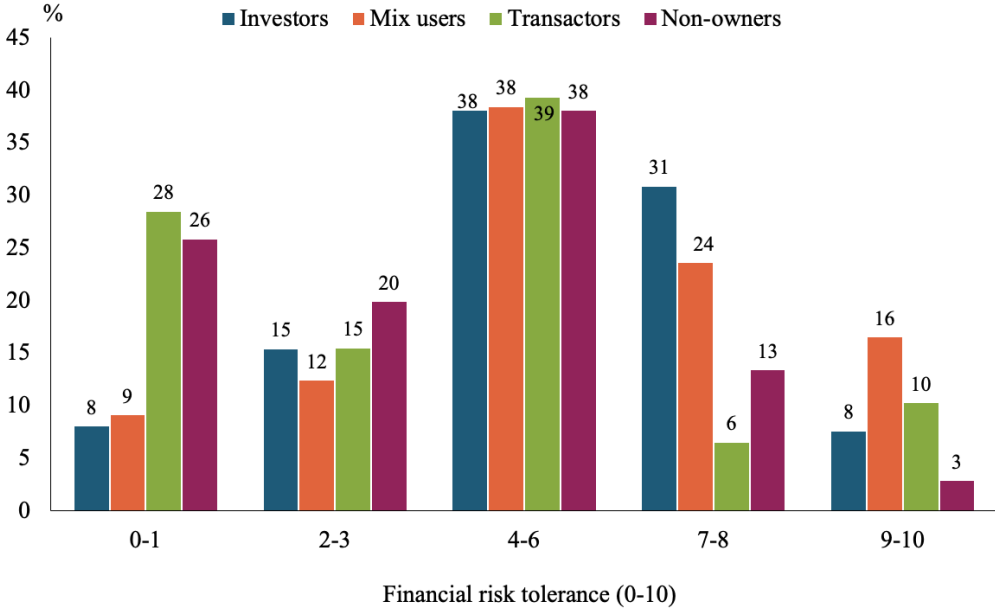
Sources: Federal Reserve Board and authors’ calculations.

To measure respondents’ financial risk tolerance, the SHED asks the following question: “Some people are fully prepared to take financial risks when they save or make investments, while others try to avoid taking financial risks. On a scale from zero to ten, where zero is not at



all willing to take risks and ten is very willing to take risks, what number would you be on the scale?” Figure 2 shows how each of the four groups of respondents—cryptocurrency investors, mix users, transactors, and nonowners—is distributed across five categories of financial risk tolerance scale: 0-1, 2-3, 4-6, 7-8, and 9-10. Cryptocurrency investors and mix users reported higher risk tolerance scale, while transactors and nonowners reported lower risk tolerance scale. About 40% of investors and mix users reported their risk tolerance scale to be 7 or higher, while less than 20% of transactors and nonowners reported so. More than 40% of transactors and nonowners reported their risk tolerance scale to be 3 or lower, while nearly 20% of investors and mix users reported so.

**Figure 2: Distribution of financial risk tolerance scale by type of cryptocurrency owners and nonowners**



Sources: Federal Reserve Board and authors’ calculations.

The SHED also gathers information on each respondent’s characteristics. Sociodemographic characteristics include age, race, gender, education, household income, employment, marital status, homeownership, and citizenship. Geographic characteristics include census region and metropolitan statistical area (MSA). Financial characteristics include banking status, AFS use, BNPL use, self-reported credit score, ability to meet emergency expense, demand for credit, and more. Table 2 shows the summary statistics on consumer characteristics, which include both cryptocurrency owners and nonowners.

**Table 2: Summary statistics on consumer characteristics**

Variables	Weighted share of sample (percent)	
Age	18-24	9.3
	25-34	17.7
	35-44	18.6
	45-54	14.6
	55-64	17.9
	65 and over	21.9
Race	White	62.2
	Black	12.1
	Hispanic	17.1
	Asian	5.7
	Other	2.8
Gender	Male	48.7
Education	No high school diploma	9.5
	High school diploma	29.1
	Some college	26.5
	Bachelor's degree	19.7
	Master's degree or higher	15.2
Annual household income	\$0- \$24,999	12.4
	\$25,000 - \$49,999	16.1
	\$50,000 - \$74,999	15.8
	\$75,000 - \$99,999	12.7
	\$100,000 and over	42.9
Employment	Government	10.6
	Private	35.6
	Non-profit	7.2
	Self-employed, family business	9.8
	Not employed or other	36.8
Marital status	Married	55.0
Homeownership	Homeowner	72.5
Citizenship	Non-U.S. citizen	8.9
MSA status	Metropolitan	86.7
Census region	Northeast	17.4
	Midwest	20.7
	South	38.3
	West	23.7
Banking status	Unbanked	6.0
AFS use	Used	14.6
Buy now, pay later (BNPL) use	Used	12.1
Self-reported credit score	Excellent	44.7
	Fair/good	31.4
	Very poor/poor	7.2
	Don't know or missing	16.8
Ability to meet emergency expenses	Pay without borrowing	71.0
	Pay with borrowing or other	16.6

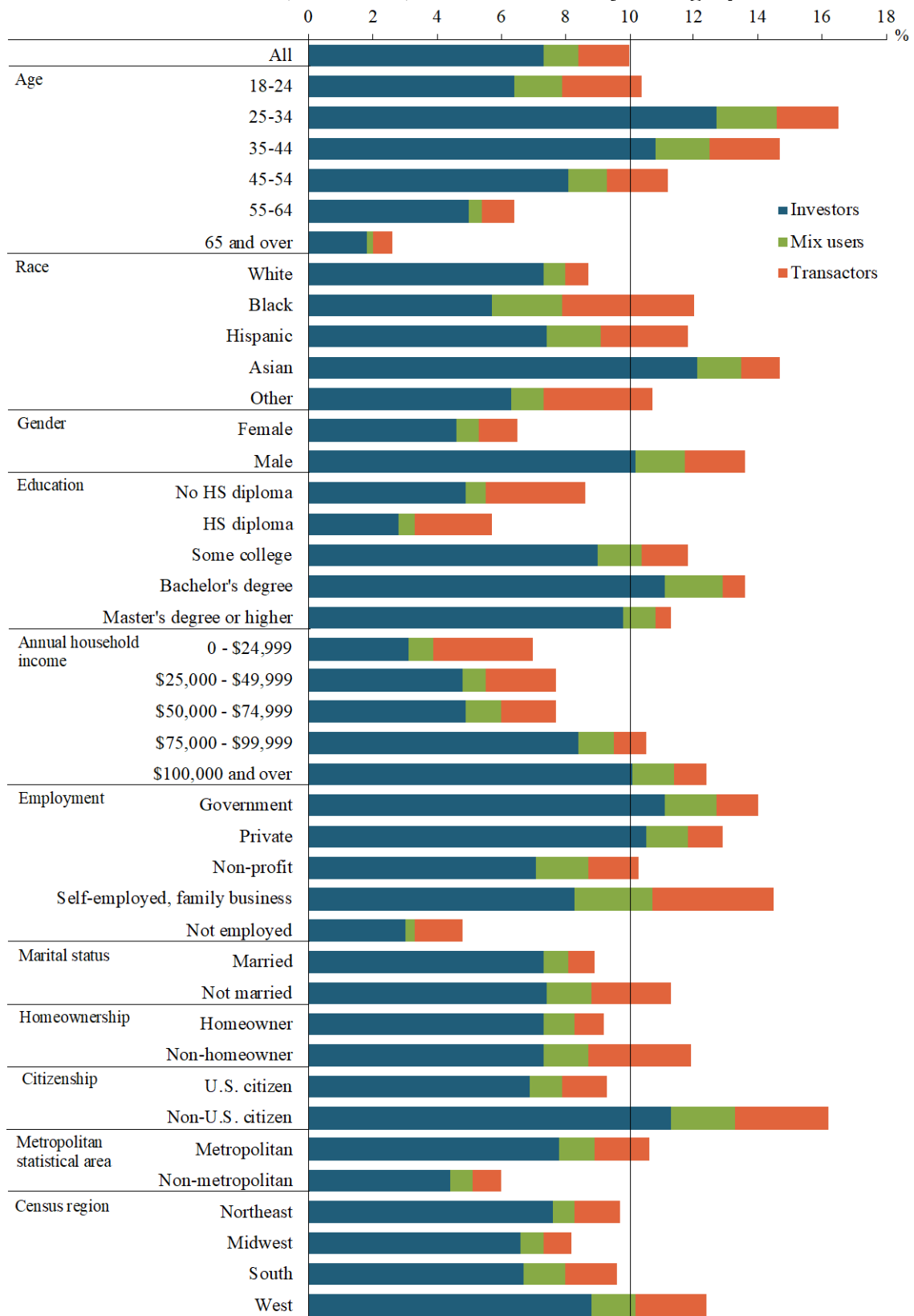
	Unable to pay	12.5
Demand for credit	Applied for credit	34.9
	Desired but not applied	6.5
	Neither applied nor desired	58.5

Sources: Federal Reserve Board and authors' calculations.

As previous literature has found, some consumer characteristics are highly correlated with cryptocurrency ownership rates. Figures 3a and 3b show cryptocurrency ownership rates by consumer demographic characteristic and financial characteristic, respectively, and the ownership rates are divided into three types – investors, transactors, or mix users. For example, among consumers 18-24 years old, 6.5% own cryptocurrencies for investment only, 1.5% own them for both investment and transactions, 2.5% own them for transactions only, and a total of 10.4% own cryptocurrencies. Overall, Figure 3a shows that cryptocurrency ownership rates are higher among younger consumers, those of a racial minority, male, college degree holders, higher income-earners, self-employed, unmarried, non-U.S. citizens, non-homeowners, residing in the Western census region, and in MSA. Some of these characteristics do not align with those of other conventional asset owners in general. For example, stock market participants tend to be older, white, more educated (master's or higher), homeowners, and U.S. citizens.

Although cryptocurrency ownership is higher among consumers of a racial minority, the composition varies by race. The share of investors is remarkably higher among Asian consumers (12%) than any other race group. The share of transactors is the highest among Black consumers (4.1%), followed by consumers of other races (3.4%) and Hispanic consumers (2.7%). The share of mix users is also the highest among Black consumers (2.2%), followed by Hispanic consumers (1.7%) and Asian consumers (1.4%). While the share of investors is distinctly higher among males (10.2%) than females (4.6%), the same disparity does not hold in the case of mix users and transactors. The type of cryptocurrency ownership varies across education levels and income levels as well. The shares of transactors are higher among consumers with a low education level (i.e., high school diploma or less) and among low-income earners. In contrast, the share of investors is higher among consumers with a high education level (at least some college experience, bachelor's, or master's degree) and among high-income earners.

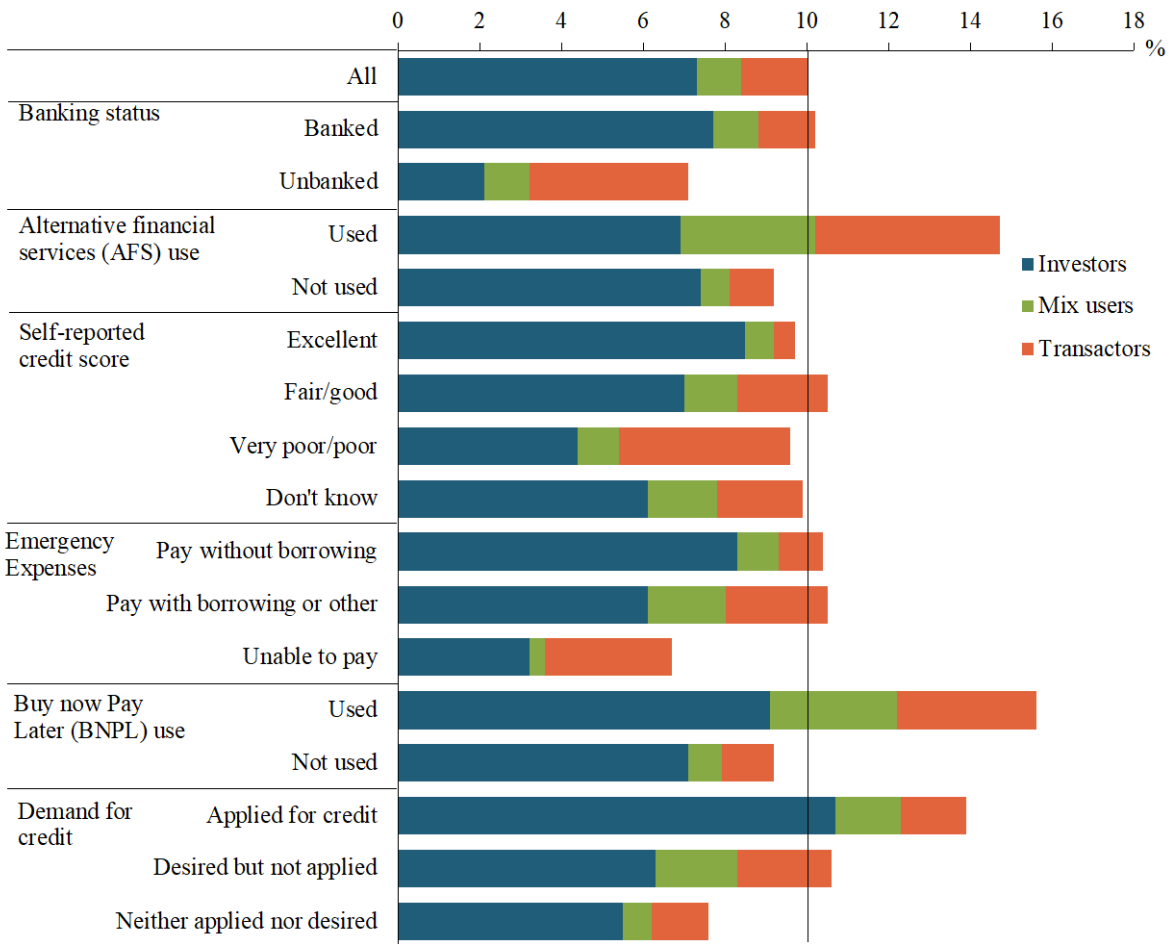
**Figure 3a: Shares of investors, mix users, and transactors by demographic characteristic**



Sources: Federal Reserve Board and authors' calculations.

Overall, Figure 3b shows that cryptocurrency ownership is significantly high among AFS users, BNPL users, and those who applied for credit. The share of investors is significantly high among consumers who applied for credit, BNPL users, and those with an excellent credit score. The share of mix users is significantly high among AFS users and BNPL users. Finally, the share of transactors is significantly high among unbanked consumers, those with a poor or very poor credit score, as well as AFS users and BNPL users.

**Figure 3b: Shares of investors, mix users, and transactors by financial characteristics**



Sources: Federal Reserve Board and authors' calculations.

## 2.2. Empirical methodology

We run a multinomial (weighted) logit model to examine whether and how financial literacy and financial risk tolerance are correlated with each of the three types of cryptocurrency

owners, after controlling for sociodemographic and financial characteristics. Two equations below mathematically describe the model:

$$\begin{aligned}
 \text{Prob}(Y_i = j) &= \frac{\exp(\alpha_j + \beta_j \cdot X_i + \gamma_j \cdot FL_i + \delta_j \cdot RT_i)}{\mathbf{1} + \sum_{k=1}^3 \exp(\alpha_k + \beta_k \cdot X_i + \gamma_k \cdot FL_i + \delta_k \cdot RT_i)} \text{ for } j=1, 2, 3, \\
 \text{Prob}(Y_i = 0) &= \frac{\mathbf{1}}{\mathbf{1} + \sum_{k=1}^3 \exp(\alpha_k + \beta_k \cdot X_i + \gamma_k \cdot FL_i + \delta_k \cdot RT_i)}.
 \end{aligned}$$

$Y_i = 1$  if consumer  $i$  is an investor, 2 if the consumer is a mix user, 3 if the consumer is a transactor, and 0 if the consumer is a nonowner of cryptocurrency.  $X_i$  is the vector of explanatory dummy variables including consumer  $i$ 's sociodemographic characteristics such as age, race, ethnicity, gender, annual household income, type of employment, homeownership, census region, whether residing in a metropolitan statistical area, whether a U.S. citizen, and financial characteristics such as banking status, AFS use, BNPL use, self-reported credit scores, ways to finance emergency expense, and demand for credit.  $FL_i$  is the vector of dummies indicating consumer  $i$ 's correct answers to three financial literacy questions and  $RT_i$  is the vector of dummies indicating consumer  $i$ 's financial risk tolerance scale categorized into four groups (excluding the base group).

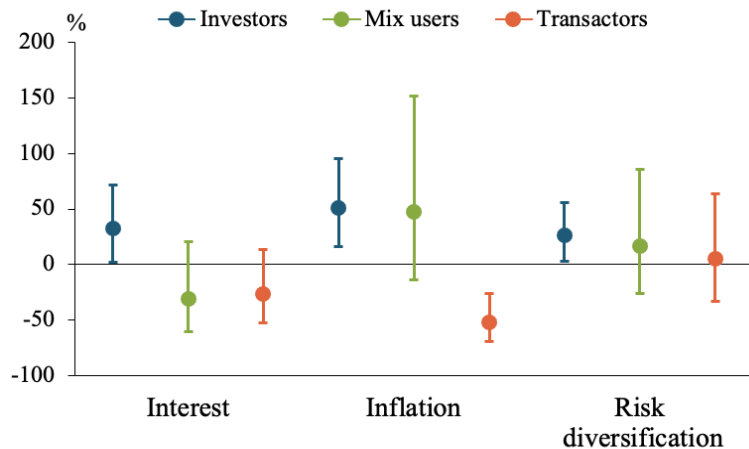
To interpret the coefficients estimated from the model, we calculate the relative risk ratio (RRR) to quantify how much more likely a consumer is to be a particular type of cryptocurrency owner (investor, transactor, or mix user) compared to being a nonowner (the benchmark category), when an explanatory dummy variable changes from zero to one, keeping all other variables constant. Relative risk ratio (RRR) is the exponentiated value of the logit coefficients. If RRR is greater (or less) than 1, the given variable is positively (or negatively) associated with being a particular type of cryptocurrency owner compared to nonowners. To show positive or negative associations more clearly, we use RRR–1 instead of RRR itself. RRR–1 implies by what percent the odds of being a particular type of cryptocurrency owner is higher (or lower) compared to being a cryptocurrency nonowner.

### 3. Results

We find significant heterogeneity across cryptocurrency investors, mix users, and transactors in objective financial literacy, risk tolerance, and other consumer characteristics.

Whether cryptocurrency owners are more financially literate than nonowners depends on owner types. Figure 4 plots the percentage differences in odds of being a cryptocurrency investor (blue), mix user (green), or transactor (orange) compared to the odds of being a nonowner (i.e., RRR-1) obtained from the multinomial logit model for the objective financial literacy questions. The cryptocurrency investors' RRR-1 is positive for all three questions, implying that correctly answering any of the three financial literacy questions increases the odds of being a cryptocurrency investor compared to the odds of being a nonowner. In contrast, correctly answering the questions on interest and inflation decreases the odds of being a transactor compared to the odds of being a nonowner. Although the odds difference in correctly answering the interest question is statistically insignificant, the odds difference in correctly answering the inflation question is statistically significant. Though statistically insignificant, correctly answering the questions on inflation and risk diversification increases, and correctly answering the questions on interest decreases, the odds of being a mix user compared to the odds of being a nonowner. Our results suggest that cryptocurrency investors tend to be more financially literate than nonowners, while transactors tend to be less financially literate than nonowners, even after controlling for all other variables.<sup>3</sup>

**Figure 4: Percent differences in odds of being a cryptocurrency investor, mix user, or transactor compared to being a nonowner by financial literacy questions**

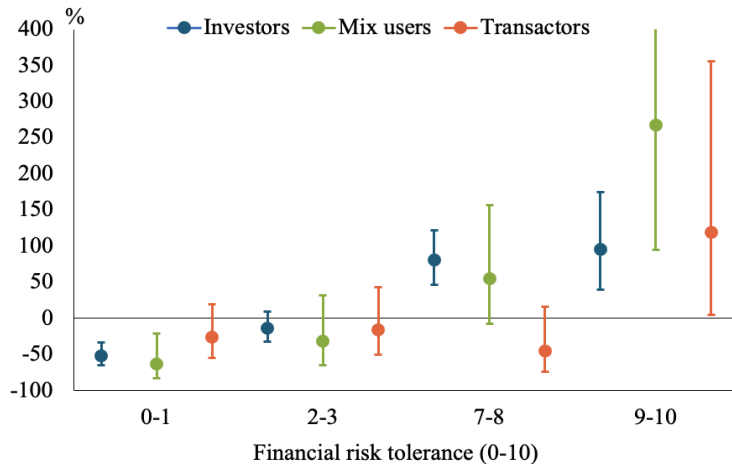


Note. A dot shows the average RRR-1 indicating the percentage difference in odds of being a cryptocurrency investor, mix user, or transactor compared to being a nonowner for answering each financial literacy question correctly and a bar shows the 95-percentile range of the RRR-1.

<sup>3</sup> As a robustness check, we use the total number of financial literacy questions answered correctly, instead of three dummies indicating each of the three financial literacy questions answered correctly. We also run another specification that excludes education variables to see potential multicollinearity issues. With these alternative specifications, our result remains qualitatively the same (See Appendix B).

Whether cryptocurrency owners are more risk tolerant than nonowners also depends on owner types. Figure 5 plots each type of cryptocurrency owners' RRR-1 regarding risk tolerance. Relative to consumers assessing their financial risk tolerance to be between 4 and 6 out of 10, which is the base risk tolerance category omitted from the regression model, consumers assessing their risk tolerance to be 9 or 10 have higher odds of being any type of cryptocurrency owner compared to the odds of being nonowner and the difference in odds is statistically significant for all types of owners. While consumers assessing their risk tolerance to be 7 or 8 have higher odds of being an investor or mix user, they have lower percentage odds of being a transactor, compared to the odds of being a nonowner. Though statistically insignificant, consumers assessing their risk tolerance to be 2 or 3 have lower odds of being any type of owner compared to the odds of being a nonowner. Finally, consumers assessing their risk tolerance to be 0 or 1 have lower odds of being any type of cryptocurrency owner compared to the odds of being a nonowner. Although the difference in odds is statistically significant for being an investor or mix user, the difference is statistically insignificant for being a transactor. Overall, cryptocurrency investors and mix users are significantly more risk tolerant than nonowners, while transactors are slightly more risk tolerant, after controlling for all other variables.<sup>4</sup>

**Figure 5: Percent differences in odds of being a cryptocurrency investor, mix user, or transactor compared to being a nonowner by risk tolerance**



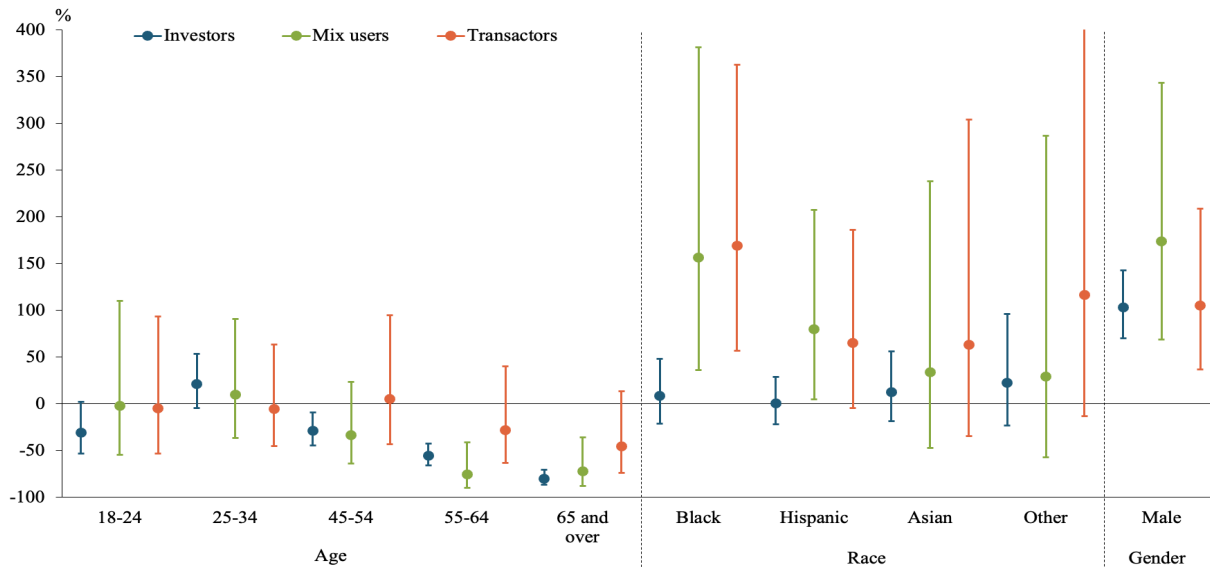
Note. A dot shows the average RRR-1 indicating the percentage difference in odds of being a cryptocurrency investor, mix user, or transactor compared to being a nonowner for a level of risk tolerance, relative to risk tolerance between 4-6, and a bar shows the 95-percentile range of the RRR-1.

<sup>4</sup> As a robustness check, we use a continuous variable of financial risk tolerance (0-10), instead of using categorical dummies for financial risk tolerance score. With this alternative specification, our result remains qualitatively the same (See Appendix B).



Some demographic characteristics are strongly correlated with being cryptocurrency owners but not necessarily correlated with being all types of owners. Figure 6 shows our results regarding age, race, and gender. Clearly, being older (age 45 or over) is negatively correlated with being a cryptocurrency investor or mix user; however, age has little association with being a transactor. Being a racial minority, especially being Black or Hispanic, is positively associated with being a transactor or mix user. Somewhat surprisingly, race has little association with being an investor. Unlike age and race, gender is correlated with all three types of cryptocurrency owners: being male is strongly associated with being an investor, mix user, or transactor.

**Figure 6: Percent differences in odds of being a cryptocurrency investor, mix user, or transactor compared to being a nonowner**

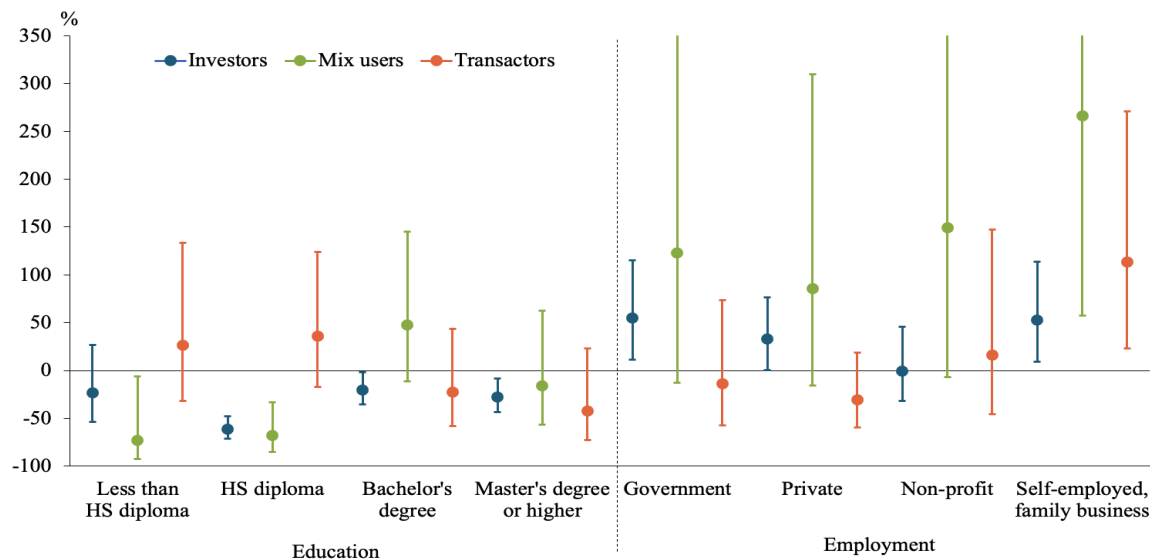


Notes. A dot shows the average RRR-1 indicating the percentage difference in odds of being a cryptocurrency investor, mix user, or transactor compared to being a nonowner for a specific age group (relative to ages 35-44), race (relative to white), and gender (relative to female). A bar shows the 95-percentile range of the RRR-1.

Figure 7 shows our results regarding education and employment. Interestingly, all education levels except “some college,” which is the base education category omitted from the regression model, are negatively associated with being a cryptocurrency investor, suggesting the investors tend to have a modest education level. Having a lower education level is negatively correlated with being a mix user, while education has little association with being a transactor after controlling for all other variables. Being self-employed or employed for a family business is positively correlated with all three types of cryptocurrency owners, while being employed by

government and by a private company are positively correlated with being an investor or mix user but not with being a transactor.

**Figure 7: Percent differences in odds of being a cryptocurrency investor, mix user, or transactor compared to being a nonowner**

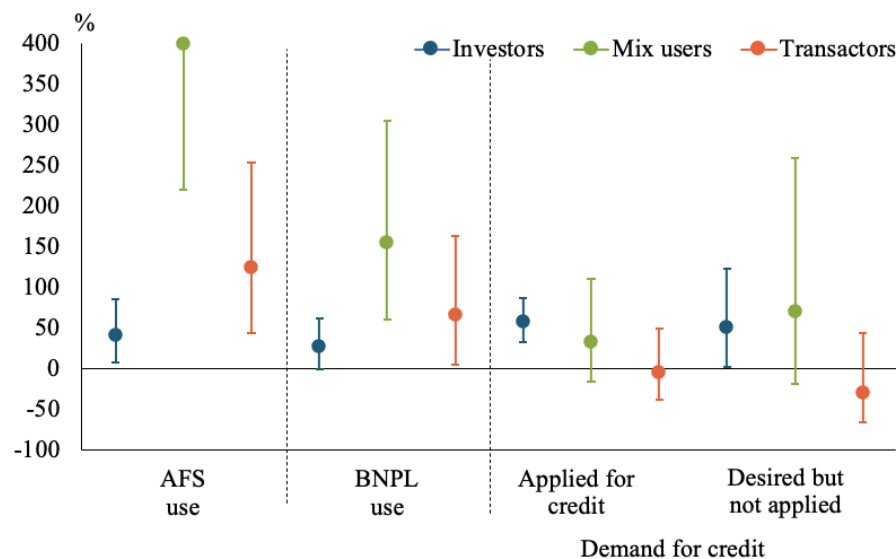


Notes. A dot shows the average RRR-1 indicating the percentage difference in odds of being a cryptocurrency investor, mix user, or transactor compared to being a nonowner for a specific education level (relative to having some college experience) and employment type (relative to working for the government). A bar shows the 95-percentile range of the RRR-1.

In addition to the demographic categories discussed above, income, citizenship, marital status, and census region are correlated with at least one type of cryptocurrency owners, even after controlling for all other variables (see Table A1 in the Appendix A). Having a higher household income and being a non-U.S. citizen is significantly positively correlated with being investors. Being married is significantly negatively correlated with being a transactor. Living in the Midwest region is significantly negatively correlated with being an investor and a transactor.

Some of the financial characteristics are also associated with cryptocurrency ownership. Figure 8 shows the results regarding AFS use, BNPL use, and demand for credit. AFS users and BNPL users tend to be all three types of cryptocurrency owners, but this tendency is particularly strong for mix users. Consumers who demand for credit—both those who applied for credit and those who desired but did not apply for credit—tend to be investors or mix users but not transactors.

**Figure 8: Percent differences in odds of being a cryptocurrency investor, mix user, or transactor compared to being a nonowner**



Notes. A dot shows the average RRR-1 indicating the percentage difference in odds of being a cryptocurrency investor, mix user, or transactor compared to being a nonowner for using AFS, using BNPL services, and having a demand for credit (relative to neither applied nor desired). A bar shows the 95-percentile range of the RRR-1.

Two other financial characteristics—self-reported credit score and ability to meet emergency expense of \$400—are noteworthy because they reflect financial well-being or vulnerability. Consumers who report a lower credit score are more likely to be a transactor, while those who do not know or do not report credit score are more likely to be a mix user, and those who report an excellent credit score are more likely to be an investor (see Table A1 in the Appendix A). Inability to meet emergency expense of \$400 is statistically significantly negatively associated with being a mix user. Though statistically insignificant, inability to meet emergency expense is negatively associated with being an investor but positively associated with being a transactor (see Table A1 in the Appendix A).

Our results suggest that cryptocurrency transactors are more likely to be financially vulnerable than investors. Transactors tend to be less financial literate, a racial minority (Black), and having a lower credit score. In contrast, investors tend to be more financial literate, more financial risk tolerant, higher income earners, and having an excellent credit score. Whether mix users are financially vulnerable is inconclusive: they tend to be more financial risk tolerant and able to meet a \$400 emergency expense, but they tend to be a racial minority (Black or Hispanic) and users of AFS.

#### **4. Policy implications**

The ability to navigate the risks of the cryptocurrency market may vary among cryptocurrency owners. Cryptocurrency investors and transactors with lower financial literacy and risk tolerance may face increased challenges in navigating the extreme fluctuations in this market, encountering high and ambiguous fees when using cryptocurrency for transactions, and dealing with the consequences of lack of regulations in the market, including fraud and scams. Breaking down the cryptocurrency owners by the purpose of holding cryptocurrencies allows us to observe the heterogeneity across cryptocurrency owners, not only in terms of their financial literacy and risk tolerance, but also regarding demographic and financial characteristics. Our findings provide insights to policymakers, consumer affairs advocates, and financial services providers in their efforts to enhance consumer awareness of risks associated with cryptocurrencies and consider the development of consumer protection policies and strategies targeted towards each type of cryptocurrency owners.

Our results indicate that cryptocurrency investors may not be particularly financially vulnerable as they tend to be more financial literate and risk tolerate, report a higher credit score, be able to meet emergency expenses, and have higher demand for credit (and may be more accessible to credit as well). Nevertheless, investing in the cryptocurrency market characterized by frequent episodes of severe price fluctuations may hinder their financial standing. The market is also characterized by rampant theft, fraud, and illicit activities including money laundering. A few recent legislative proposals in Congress reflect policy considerations to address these challenges associated with cryptocurrency investments. These bills emphasize consumer protection by requiring crypto asset intermediaries to provide clear notice to each customer of asset segregation methods, treatment of customer assets in the case of bankruptcy or insolvency, and the time and procedure of returning crypto assets upon customer's request, among others (Sidley Austin LLP 2023).

The use of cryptocurrency for transactions also merits examination. Our results suggest that cryptocurrency transactors may be especially financially vulnerable as they tend to be less financially literate and belong to vulnerable groups of population. Furthermore, these transactors are more likely to use BTMs, whose risky business and high and unpredictable fees have been reported (Godoy 2022; Thomson Reuters Institute 2022; Noll 2023). According to the 2022 SHED data, about half of transactors and less than 40% of mix users use BTMs, while only 7%

of investors use BTMs. In California, in addition to a new virtual currency licensing regime, a new law imposes requirements on BTM operators, enhancing consumer protections. Those requirements include a \$1,000 daily transaction limit per customer, disclosures of the terms and conditions including whether the operator provides a method to reverse or refund the transaction, and the total fees and charges that should not exceed the greater of \$5 or 15% of the transaction value (Cooley 2023).

Finally, our results suggest the importance of raising awareness and education about the risks of cryptocurrency ownership in general as well as risks associated with specific activities such as investment and transactions. Individuals and organizations engaged in financial education, financial planning or advising roles, and consumer protections and advocacy can work to inform their clients or the masses of the extreme volatility of the cryptocurrency market, a practical picture of the potential outcomes of their cryptocurrency investment, the lack of regulations and supervision, and various fees associated with cryptocurrency transactions or investment.

## **5. Conclusion**

While cryptocurrency owners with sufficient financial literacy and appropriate risk tolerance may be able to avoid or mitigate the risks of owning cryptocurrency, those lacking sufficient financial literacy or having inappropriate risk appetite may not be equipped to weather the risks involved. In this study, we use the 2022 SHED data to examine whether financial literacy and risk tolerance vary across different groups of cryptocurrency owners and nonowners. We divide cryptocurrency owners into three groups—investors, transactors, and mix users—and run a multinomial logit model.

We find significant heterogeneity in objective financial literacy, risk tolerance, and demographic and financial characteristics across the three groups of cryptocurrency owners. Cryptocurrency investors and mix users are significantly or moderately more financially literate than nonowners, but transactors are less financially literate than nonowners, even after controlling for all other variables. Investors and mix users are significantly more risk tolerant, while transactors are slightly more tolerant, than nonowners. Compared to nonowners, all three types of owners tend to be male, be self-employed or work for family business, and use alternative financial services (AFS) as well as buy-now-pay-later (BNPL) services. Investors and

mix users tend to be younger and moderately educated but education has little association with transactors. Investors tend to be high income-earners and demand for credit, but income and demand for credit have no association with mix users and transactors. Black and Hispanic consumers are positively associated with transactors and mix users but not associated with investors. Finally, transactors tend to have a lower credit score. Our results suggest transactors may be especially financially vulnerable, while investors may not.

Our study contributes to the existing literature and draws policy implications. Consistent with Fujiki (2020), we find a positive relationship between objective financial literacy and cryptocurrency investment. Consistent with most existing studies, we find a positive relationship between risk tolerance and cryptocurrency investment. Our study uncovers additional characteristics that are highly associated with cryptocurrency investors, mix users, transactors, or overall owners, such as self-employed, AFS and BNPL uses, and self-reported credit scores. Our study sheds light on the importance of consumer protection in the cryptocurrency industry, with special attention to cryptocurrency owners who use it for transactions as they may be more financially vulnerable.

Although our results clearly suggest a positive (or negative) relationship between objective financial literacy and cryptocurrency investors (or transactors), our study relies only on three financial literacy questions. Because the cryptocurrency market is complex, answering these three questions correctly may not mean that cryptocurrency investors are sufficiently literate financially or own sufficient knowledge about cryptocurrencies. Adding more financial literacy questions and questions about cryptocurrency-related knowledge would help assess cryptocurrency investors' financial literacy more accurately.

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## Appendix A: Additional results

**Table A1: Percent differences in odds of being a cryptocurrency investor, mix user, or transactor compared to being a nonowner**

		Investors	Mix users	Transactors
Financial literacy	Interest	0.322* [0.016,0.719]	-0.31 [-0.604,0.203]	-0.265 [-0.525,0.138]
	Inflation	0.505* [0.163,0.947]	0.469 [-0.141,1.514]	-0.522* [-0.692,-0.259]
	Risk diversification	0.266* [0.029,0.557]	0.170 [-0.261,0.853]	0.051 [-0.326,0.638]
Risk tolerance	0-1	-0.515* [-0.646,-0.335]	-0.626* [-0.822,-0.213]	-0.263 [-0.548,0.201]
	2-3	-0.141 [-0.324,0.091]	-0.317 [-0.646,0.319]	-0.153 [0.501,0.436]
	7-8	0.805* [0.470,1.217]	0.545 [-0.072,1.572]	-0.452 [-0.741,0.160]
	9-10	0.959* [0.398,1.744]	2.678* [0.947,5.945]	1.192* [0.053,3.563]
Age	18-24	-0.305 [-0.527,0.022]	-0.022 [-0.546,1.105]	-0.046 [-0.530,0.936]
	25-34	0.209 [-0.046,0.533]	0.102 [-0.363,0.906]	-0.054 [-0.454,0.639]
	45-54	-0.291* [-0.447,0.09]	-0.333 [-0.64,0.238]	0.054 [-0.43,0.950]
	55-64	-0.556* [-0.659,-0.424]	-0.753* [-0.896,-0.414]	-0.283 [-0.634,0.404]
	65 and over	-0.798* [-0.862,-0.706]	-0.723* [-0.88,-0.361]	-0.452 [-0.736,0.137]
Race	Black	0.083 [-0.208,0.481]	1.564* [0.364,3.819]	1.694* [0.570,3.624]
	Hispanic	0.005 [-0.215,0.287]	0.796* [0.049,2.076]	0.656 [-0.042,1.863]
	Asian	0.129 [-0.183,0.561]	0.34 [-0.469,2.381]	0.631 [-0.342,3.046]
	Other	0.226 [-0.232,0.959]	0.291 [-0.569,2.866]	1.166 [-0.132,4.408]
Gender	Male	1.034* [0.705,1.427]	1.74* [0.690,3.441]	1.055* [0.367,2.088]
Education	No high school diploma	-0.231 [-0.535,0.270]	-0.733* [-0.924,-0.064]	0.262 [-0.319,1.336]
	High school diploma	-0.615* [-0.717,-0.476]	-0.682* [-0.849,-0.334]	0.361 [-0.172,1.238]
	Bachelor's degree	-0.205* [-0.355,-0.021]	0.474 [-0.114,1.455]	-0.224 [-0.579,0.433]
	Master's degree or higher	-0.280* [-0.432,-0.087]	-0.160 [-0.566,0.626]	-0.423 [-0.729,0.229]
Annual household income	\$0 - \$24,999	0.136 [-0.275,0.756]	-0.044 [-0.619,1.401]	-0.362 [-0.662,0.203]
	\$25,000 - \$49,999	0.348 [-0.045,0.901]	-0.327 [-0.711,0.570]	-0.199 [-0.554,0.441]
	\$75,000 - \$99,999	0.563* [0.136,1.150]	0.08 [-0.49,1.284]	-0.291 [-0.684,0.593]

		\$100,000 and over	0.454*	0.349	0.44
			[0.105,0.913]	[-0.277,1.520]	[-0.257,1.794]
			Investors	Mix	Transactors
Employment	Government	0.55*	1.225	-0.14	
		[0.116,1.154]	[-0.124,4.650]	[0.575,0.739]	
	Private	0.332*	0.86	-0.305	
		[0.003,0.767]	[-0.156,3.099]	[-0.594,0.190]	
	Non-profit	-0.005	1.494	0.16	
		[-0.322,0.459]	[-0.074,5.714]	[-0.457,1.474]	
	Self-employed, family business	0.525*	2.665*	1.137*	
		[0.088,1.138]	[0.572,7.545]	[0.229,2.716]	
Marital status	Married	-0.124	-0.218	-0.443*	
		[-0.274,0.057]	[-0.493,0.205]	[-0.658,-0.091]	
Homeownership	Homeowner	0.014	0.007	-0.354	
		[-0.176,0.248]	[-0.402,0.696]	[-0.617,0.090]	
Citizenship	Non-U.S. citizen	0.824*	-0.085	0.488	
		[0.328,1.504]	[-0.582,1.003]	[-0.188,2.726]	
Metropolitan status	Metropolitan	0.302	0.018	0.727	
		[-0.03,1.746]	[-0.488,1.025]	[-0.17,2.593]	
Census region	Northeast	-0.132	-0.469	-0.264	
		[-0.326,0.119]	[-0.736,0.070]	[-0.593,0.331]	
	Midwest	-0.255*	-0.435	-0.521*	
		[-0.416,-0.049]	[-0.703,0.074]	[-0.744,-0.101]	
	South	-0.163	-0.164	-0.37	
		[-0.323,0.036]	[-0.491,0.373]	[-0.609,0.016]	
Banking status	Unbanked	-0.473	0.083	-0.211	
		[-0.749,0.109]	[-0.577,1.777]	[-0.591,0.521]	
AFS use	Used	0.405*	3.991*	1.245*	
		[0.070,0.844]	[2.194,6.800]	[0.426,2.534]	
Self-reported credit score	Fair/good	-0.082	0.239	0.99*	
		[-0.259,0.138]	[-0.29,1.164]	[0.099,2.604]	
	Very poor/poor	-0.096	0.03	1.703*	
		[-0.422,0.413]	[-0.615,1.757]	[0.274,4.734]	
	Don't know or missing	-0.289*	1.177*	0.537	
		[-0.479,-0.028]	[0.126,3.208]	[-0.249,2.147]	
Ability to meet emergency expenses	Pay without borrowing	-0.021	-0.316	0.187	
		[-0.253,0.284]	[-0.609,0.198]	[-0.315,1.058]	
	Unable to pay	-0.3	-0.749*	0.033	
		[-0.528,0.039]	[-0.891,-0.424]	[-0.394,0.761]	
BNPL use	Used	0.264	1.539*	0.655*	
		[-0.013,0.620]	[0.597,3.037]	[0.039,1.635]	
Demand for credit	Applied for credit	0.574*	0.326	-0.047	
		[0.325,0.871]	[-0.162,1.098]	[-0.392,0.494]	
	Desired but not applied	0.508*	0.696	-0.303	
		[0.019,1.232]	[-0.198,2.585]	[-0.662,0.439]	
	Constant	-0.976*	-0.997*	-0.989*	
		[-0.988,-0.954]	[-0.999,-0.987]	[-0.997,-0.952]	

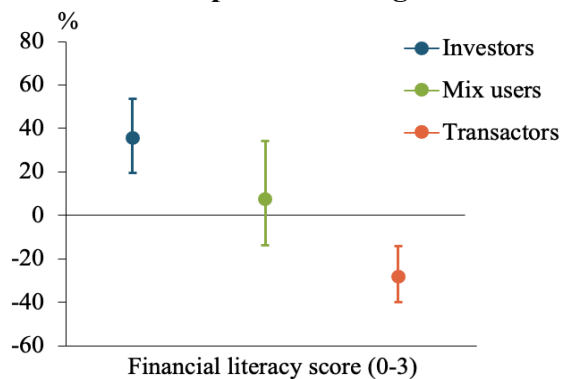
N = 11,667

Notes: \*: p-value is less than 0.05. The 95% confidential interval are in [ ]. The base characteristics, which are omitted from explanatory variables, are 35 to 44 (age of householder), white (race), female (gender), some college(education), \$50,000-\$74,999 (income), not employed (employment), west (census region), excellent (self-reported credit score), pay with borrowing or other (ability to meet emergency expenses), and neither applied nor desired for credit in the past year (demand for credit).

## Appendix B: Robustness checks

We conduct several checks to test the robustness of our results in Section 3, particularly those concerning the variables of interest – financial literacy and risk tolerance. First, instead of considering each financial literacy question separately, we consider the total number of financial literacy questions each respondent answers correctly, i.e., total financial literacy score. A robustness check confirms that cryptocurrency investors are more financial literate than nonowners and that transactors are less financial literate than nonowners (Figure B1).

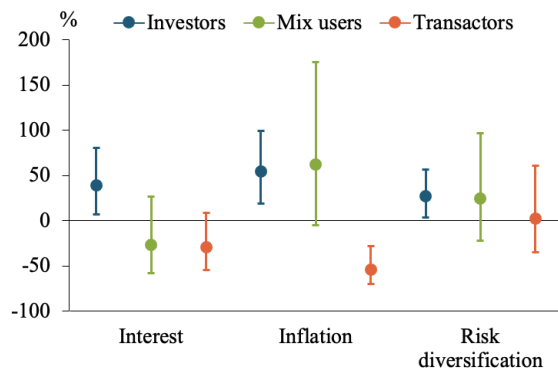
**Figure B1: Percent difference in odds of being a cryptocurrency investor, mix user, or transactor compared to being a nonowner by financial literacy (continuous score)**



Note. A dot shows the average RRR-1 indicating the percentage difference in odds of being a cryptocurrency investor, mix user, or transactor compared to being a nonowner as financial literacy score increases by one unit, and a bar shows the 95-percentile range of the RRR-1.

Second, we exclude education variables from the regression model because financial literacy and education may be significantly correlated, potentially suffering a multicollinearity issue. Excluding education variable barely change our results in Section 3 (Figure B2).

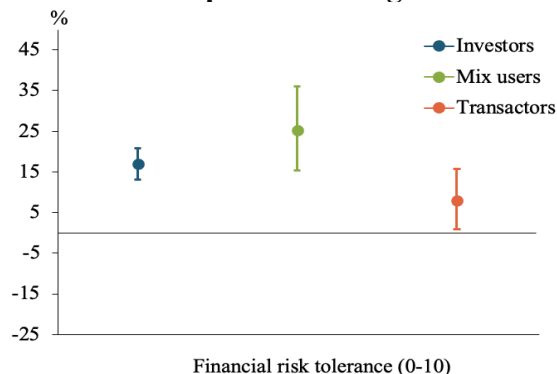
**Figure B2: Percent difference in odds of being a cryptocurrency investor, mix user, or transactor compared to being a nonowner by financial literacy (excluding education)**



Note. A dot shows the average RRR-1 indicating the percentage difference in odds of being a cryptocurrency investor, mix user, or transactor compared to being a nonowner for answering each financial literacy question correctly, and a bar shows the 95-percentile range of the RRR-1.

Third, instead of splitting the self-reported financial risk tolerance score into five groups and treating them as categorical variables, we use a continuous variable of financial risk tolerance (0-10). A robustness check confirms that our findings in Section 3: risk tolerance is significantly positively associated with being an investor or a mix user (Figure B3). However, using a continuous variable also results in a significant positive association between risk tolerance and transactors, failing to capture nuance of transactors' risk tolerance relative to that of nonowners. Although consumers with risk tolerance between 9 and 10 are more likely to be a transactor than a nonowner, consumers with risk tolerance between 7 and 8 are less likely to be a transactor than a nonowner.

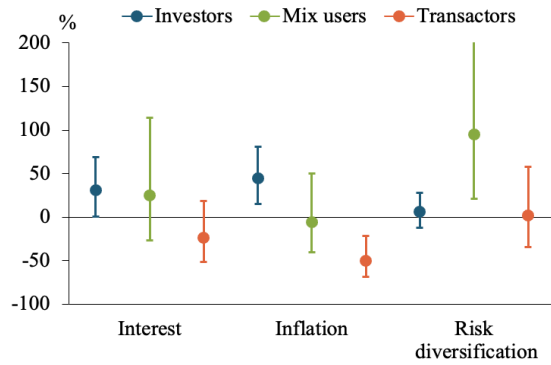
**Figure B3: Percent difference in odds of being a cryptocurrency investor, mix user, or transactor compared to being a nonowner by financial risk tolerance (continuous scale)**



Note. A dot shows the average RRR-1 indicating the percentage difference in odds of being a cryptocurrency investor, mix user, or transactor compared to being a nonowner as a risk tolerance scale increases by one unit, and a bar shows the 95-percentile range of the RRR-1.

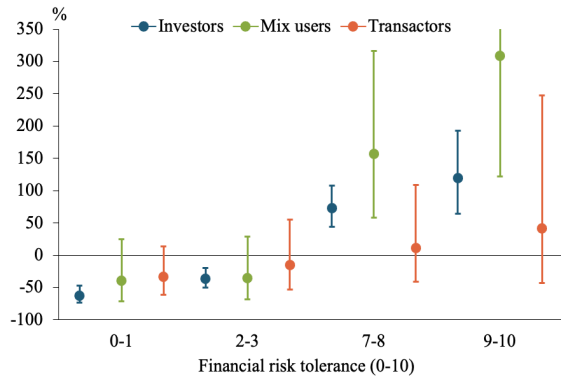
As the final robustness check, we use the 2021 round of SHED data and run the same multinomial logit model as in Section 3. The results for financial literacy and risk tolerance from the 2021 data are very similar to those from the 2022 data as shown in Figures B4 and B5. However, some of the results for demographic and financial characteristics are different between the 2022 and 2021 data. With the 2021 data, while racial minorities (Black and Hispanic) remain correlated with transactors, they are not correlated with mix users and Black is correlated with investors. Self-employed remains correlated with investors and mix users, but not with transactors. Lower self-reported credit scores remain to be positively correlated with transactors, but they are not statistically significant with the 2021 data.

**Figure B4: Percent difference in odds of being a cryptocurrency investor, mix user, or transactor compared to being a nonowner by financial literacy (2021)**



Note. A dot shows the average RRR-1 indicating the percentage difference in odds of being a cryptocurrency investor, mix user, or transactor compared to being a nonowner for answering each financial literacy question correctly and a bar shows the 95-percentile range of the RRR-1.

**Figure B5: Percent difference in odds of being a cryptocurrency investor, mix user, or transactor compared to being a nonowner by risk tolerance (2021)**



Note. A dot shows the average RRR-1 indicating the percentage difference in odds of being a cryptocurrency investor, mix user, or transactor compared to being a nonowner for a level of risk tolerance, relative to risk tolerance between 4-6, and a bar shows the 95-percentile range of the RRR-1.