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Personality Traits and Financial Outcomes

Claire Greene, Oz Shy, and Joanna Stavins

Abstract:

The Big Five personality traits—openness to experience, conscientiousness, extroversion, agreeableness, and neuroticism—are widely used in understanding human behavior. Using data collected from a survey and diary of consumer payment choice, we investigate how the Big Five traits affect three financial outcomes: being unbanked, holding a credit card, and carrying credit card debt. Although each personality trait is correlated with each of the financial outcomes we examine, they mostly become statistically insignificant when we control for demographics and income in regressions. Carrying credit card debt (revolving), however, is significantly affected by conscientiousness, openness, and agreeableness: Credit card adopters who are less conscientious, more open to experiences, or more agreeable are significantly more likely to revolve credit card debt. A machine learning algorithm confirms that conscientiousness is the major factor separating revolvers from other credit cardholders.

JEL Classifications: D12, D14, E42

Keywords: credit card debt, consumer payments, personality traits, financial behavior, unbanked

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This paper presents preliminary analysis and results intended to stimulate discussion and critical comment.

The views expressed herein are those of the authors and do not indicate concurrence by the Federal Reserve Bank of Boston, the Federal Reserve Bank of Atlanta, the principals of the Board of Governors, or the Federal Reserve System.

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1. Introduction

The Big Five personality traits—openness to experience, conscientiousness, extroversion, agreeableness, and neuroticism—are a widely used framework for understanding human behavior.¹ Using data collected from a survey and diary of consumer payment choice, we investigate whether the Big Five traits affect three types of financial outcomes: having a bank account, possessing (or “holding”) a credit card, and carrying debt (or “revolving”) on a credit card. Finding that personality, a seemingly nonfinancial factor, can influence financial outcomes would have implications for consumer education and interventions designed to address debt, for financial product design and consumer protection, and for investments in noncognitive skills (especially as part of early education). We test whether the Big Five personality traits significantly affect financial behavior when examined in the context of other important factors: income, demographics, and financial literacy.

Examined in isolation, many demographic and financial variables are closely related to the aforementioned financial outcomes, as demonstrated by the descriptive statistics in Table 1 and Table 2. The machine learning classification trees also show how the Big Five traits are related to financial behavior (Figures 1, 2, and 3 in Appendix A). We find that when we control for demographic and income variables in regressions, the personality traits become insignificant in predicting whether someone is unbanked or adopts a credit card. However, the traits remain significant in predicting which cardholders revolve on their credit cards: Credit card adopters who are less conscientious, more open, or more agreeable are significantly more likely to carry unpaid credit card debt.

We add to the literature on personality traits and financial behavior by including data on adult consumers of all ages (18 and older); previous research on this topic is limited to people 50 and older (Choi and Laschever 2018). In addition to credit card adoption and borrowing, we examine bank account adoption. We include machine learning outcomes as well as econometric regressions. Outcomes are defined narrowly and objectively, with yes/no responses to factual questions.

¹ The Big Five are codified in the work of McCrae and Costa (1999) and McCrae (2004), although the term “Big Five” is used in earlier research.

The remainder of this paper is organized as follows. Section 2 reviews the literature on personality, financial literacy, income, demographics, and financial behaviors. Section 3 describes the data. Section 4 uses descriptive statistics to compare consumers based on their financial behavior. Section 5 explores the correlation of income and demographics with the personality traits and also with the financial outcomes. Section 6 uses econometric regressions to test whether including personality traits changes the way income and demographic attributes affect financial behavior. Section 7 concludes.

2. Literature

Approximately 4.5 percent of US households are estimated to be unbanked (Federal Deposit Insurance Corporation [FDIC] 2021), and about one-quarter do not own any credit cards (Board of Governors 2020). Among credit cardholders,² credit card borrowing is common.³ Consumers' financial decisions, including whether to have a bank account or own a credit card, and—for credit cardholders—whether to carry unpaid balances, are correlated with many observable attributes, including age, income, and education (Koulayev et al. 2016; Stavins 2017, 2020a, 2020b). Financial literacy also influences financial behaviors (Lusardi, Mitchell, and Curto 2009; Lusardi and Mitchell 2006, 2008).

How are the personality traits defined, and how do they relate to financial behavior?⁴

- **Conscientiousness:** organization, productiveness, responsibility. It is a proxy for self-control and better financial planning. We expect more conscientious individuals to be more likely to have a bank account and a credit card and to pay off their credit card balances on time.
- **Agreeableness:** compassion, respectfulness, trust in others. More agreeable individuals may be more likely to be influenced by advertising and more likely to give in to pressure from peers.
- **Extroversion:** sociability, assertiveness. Extroverts may be savvier consumers and more likely to shop around for better deals.
- **Openness to experience:** intellectual curiosity, creative imagination. Openness has been found to be correlated with having credit card debt.

² A cardholder is someone who has a credit card. We also refer to cardholders as credit card adopters.

³ According to the Survey of Consumer Finances, about half of all credit card accounts revolved in 2019 (Board of Governors 2020).

⁴ The source of the definitions for the personality traits is “Big 5 Personality Traits,” Psychology Today website, <https://www.psychologytoday.com/us/basics/big-5-personality-traits>, accessed March 9, 2023. The expected effects on financial outcomes are partly based on Choi and Laschever (2018).

- Neuroticism: tendencies toward anxiety and depression.

Some financial decisions—for example, the decision to carry credit card debt—have been found to be affected by personality traits. Many households carry credit card debt despite having liquid assets in the bank (the credit card debt puzzle; see, for example, Greene and Stavins 2022). Holding income and demographics constant, Choi and Laschever (2018) find that heads of households who are more open, agreeable, and introverted and less conscientious are more likely to be credit card revolvers and also more likely to hold some liquid assets. Gathergood and Weber (2014), measuring self-control, find that consumers who simultaneously hold liquid assets and revolve credit card debt are more likely than other consumers to report high rates of impulsive spending.⁵ Openness has been found to be correlated with having credit card debt (Brown and Taylor 2014) and with higher spending (Matz, Gladstone, and Stillwell 2016).

Some research relates personality to active management of personal finances. Donnelly, Iyer, and Howell (2012) find that highly conscientious individuals manage their money more than others do, resulting in increased savings, decreased debt, and less compulsive buying. Asebedo et al. (2019), using the University of Michigan Health and Retirement Study, find a relationship between openness and financial self-efficacy, defined as engaging in and following through with tasks requiring self-regulation. Using a survey of employed Australians, Hoffmann and Risse (2020) examine individuals' behavior related to finances and health and show that personality traits play a role in explaining what they call “financially responsible behavior.” Killins (2017) finds that extroversion and conscientiousness are related to financial literacy.

3. Data

We use data from the 2021 Survey and Diary of Consumer Payment Choice (SDCPC).⁶ The SDCPC surveys a representative sample of US adults (18 and older). SDCPC respondents report their bank checking account holdings, list the payment instruments they use (have adopted), and

⁵ The agree/disagree statement is “I am impulsive and tend to buy things even when I can't really afford them.” Two questions on the Big Five questionnaire that contribute to “conscientiousness” relate to impulsive behavior, one about being easily distracted and one about making plans and following through with them.

⁶ The diary is conducted through a collaboration between the Federal Reserve Banks of Atlanta, Boston, and San Francisco. The data and assisting documents (codebooks) are publicly available for downloading from the Federal Reserve Bank of Atlanta's Consumer Payments webpage, <https://www.atlantafed.org/banking-and-payments/consumer-payments.aspx>. Summary reports are given in Foster, Greene, and Stavins (2022) and Cubides and O'Brien (2022). Similar surveys are conducted by the Bank of Canada; see Henry, Huynh, and Welte (2018).

report 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. Consumers who have credit cards also report whether they revolve credit card debt and, if so, the dollar value of that debt.

We focus on the following outcomes as reported in the SDCPC (the numbers below are based on the weighted data set⁷):

- Banking status: 218 of the respondents were unbanked, or 5 percent of the sample.
- Access to credit: 24 percent of the respondents did not have a credit card.
- Credit card revolving: 41 percent of the respondents with a credit card had a positive revolving balance in the preceding month.

The SDCPC data's rich set of household income and demographic variables includes respondents' age, education, gender, ethnicity, race, employment status, and marital status. Respondents also report whether they own a home, whether they have recently experienced adverse financial events, and whether they could cover a \$2,000 emergency expense and how they would do it.

In addition, SDCPC respondents complete a companion survey in the University of Southern California Understanding America Study that assesses personality traits and financial literacy,⁸ making it possible to match the financial behaviors of individual survey respondents to their self-reported personality traits and quiz-assessed financial literacy. To assess personality traits, the survey asks respondents to indicate how strongly they agree or disagree with statements such as “I am someone who is original, comes up with new ideas” and “I am someone who is easily distracted” (the statements and their association with each personality trait are listed in Appendix B). The intensity of each trait, a composite of respondents' self-ratings, is scaled from 1 to 5.

To assess financial literacy, the survey asks three questions that measure respondents' understanding of interest rate compounding, inflation, and diversification of risk. These

⁷ The weights are used to adjust the SDCPC sample to fit the demographics of the US adult (18 and older) population. For more details, see the section on weighting in Foster and Prescott (2020).

⁸ In the USC Understanding America Study—Data Visualization Toolkit, UAS 1: Financial Literacy; Personality; Understanding Probabilities; Numeracy at <https://uasvis.usc.edu/1000/2>. We used UAS wave 237 because it most closely aligns with the timing of the 2021 SDCPC.

questions were originally posed in Lusardi, Mitchell, and Curto (2009) and Lusardi and Mitchell (2006, 2008). Our measure of financial literacy ranges from 0 (no correct answers) to 3 (all correct answers).⁹

4. Financial Outcomes and Personality Traits

In this section, we compare consumers based on their financial behavior and personality traits. We examine the correlations between the personality traits and the three financial outcomes. Table 2 shows the weighted means of the Big Five traits for each of the three financial outcomes of interest. In Appendix A, we also look at the influence of personality traits on the financial outcomes using a machine learning technique.

4.1 Bank account adoption

Unbanked consumers do not have a checking or savings account. Approximately 5 percent of the respondents in our sample are unbanked. That fraction is similar to the most recent FDIC estimate that 4.5 percent of households are unbanked (FDIC 2021; note that the SDCPC is an individual-consumer survey, not a household survey). For banked versus unbanked consumers, the differences in the average values of the personality traits are small, but most of the differences are statistically significant. Unbanked consumers are less agreeable, less conscientious, less open, and more neurotic (Table 2).

4.2 Credit card adoption

Approximately one-fourth of the sample do not have a credit card, which is consistent with the results from previous years of the survey and with other sources (Board of Governors 2020). As with the banked/unbanked comparison, the differences in the average personality traits of credit card adopters and consumers who do not have credit cards are low in value but statistically significant (Table 2). Respondents with no credit cards are less agreeable, less conscientious, less open, and more neurotic than credit card adopters. For agreeableness, conscientiousness, and openness, the differences are even smaller in magnitude compared with the differences between banked and unbanked consumers.

⁹ The questions are in Appendix C.

4.3 Credit card revolving

Among credit cardholders, 45 percent revolved on their card at some point during the preceding 12 months. Almost as many—41 percent—revolved on their card during the preceding month, indicating that most cardholders tend to either always carry an unpaid balance on their credit card or always pay their balances on time (that is, they never carry an unpaid balance). We measure revolving with the variable indicating whether a consumer revolved in the last month (results using the variable indicating whether the consumer revolved at some point in the past 12 months are very similar). With the weighted numbers, there are almost no significant differences in the average personality traits of revolvers versus consumers who never carry a balance, except that revolvers are slightly more neurotic (Table 2). However, differences between the unweighted means of revolvers' and non-revolvers' Big Five traits are much more statistically significant.

5. Demographics and Income

5.1 Personality traits, demographics, and income

While we are interested in the effect of personality traits, we also compare demographic and financial attributes among various cohorts of consumers. First, we look at the correlations between personality traits and demographic and financial characteristics. Strong correlations might imply that findings of significant effects of some socio-demographic attributes on financial decisions are spurious and that those effects can instead be explained by personality traits. Table 3 shows the correlation coefficients between the Big Five personality traits and other variables, including demographic attributes and financial variables. Many of the correlation coefficients are significant, including those that indicate the following most important relationships:

- Openness increases with education. Consumers in urban areas are more open than those in rural areas. Consumers with the highest income and those who are more financially literate are more open.
- Conscientiousness increases with age, education, and income. Women are more conscientious than men. Married, divorced, or widowed consumers are more conscientious than those who never married. Retired or employed consumers are more conscientious than those who are unemployed. Consumers who can cover a \$2,000 expense, homeowners, and people who are financially literate are more conscientious. Users of alternative financial services are less conscientious.

- Few demographic variables are correlated with extroversion. People who never married are less extroverted than other groups. Extroversion increases with income.
- Agreeableness increases with age. Women are more agreeable than men, and retired people are more agreeable than people with a different employment status. Divorced or widowed people are more agreeable than those who never married.
- Neuroticism decreases with age, education, and income. Women are more neurotic than men. White consumers are more neurotic than Black consumers. Retired people are less neurotic than people with a different employment status. People who never married are more neurotic than married or divorced people. Neuroticism also decreases with FICO scores and with financial literacy. Those who can cover a \$2,000 expense are less neurotic. Users of alternative financial services, such as tax refund anticipation loans or payday loans, are more neurotic.

5.2 Financial outcomes, demographics, income, and financial literacy

Second, we compare the means for each group of respondents to analyze the relationships that income, demographics, and financial literacy have with financial behavior.

5.2.1 Banking status

There are several large and significant differences between banked and unbanked consumers (Table 1 shows the means of the demographic variables). Relative to banked consumers, the unbanked are younger, less educated, three times more likely to be Black, four times more likely to be unemployed, and twice as likely to have never married (Table 1). Eighty-two percent of unbanked consumers have a high school or less than a high school education, compared with 36 percent of banked consumers.

Looking at the average values of financial variables (Table 2), we find that unbanked consumers have lower household income, are less likely to own a home, and are more likely to use alternative financial services. Almost 70 percent of the unbanked have an annual household income of less than \$25,000, compared with 18 percent of the banked. Only 3 percent of unbanked consumers but 32 percent of the banked have a household income of \$100,000 or more. Only 12 percent of unbanked consumers could cover a \$2,000 emergency expense, compared with 72 percent of banked consumers. Thirty-five percent of unbanked consumers have a FICO score below 600, compared with 7 percent of banked consumers. Unbanked consumers are also less financially literate: The average financial literacy score (measured on a scale of 0 to 3) is 1.14 for unbanked consumers and 2.16 for those who are banked. In Section 6,

we test whether any of those differences remain significant when we control for demographic and financial variables.

5.2.2 Credit card adopters versus non-adopters

As with the banked-unbanked breakdown, there are several large and significant differences between credit card adopters and people who do not own a credit card, whom we refer to as “non-adopters.” Compared with credit card adopters, non-adopters are seven years younger, on average, less educated, more likely to be Black, four times more likely to be unemployed, and twice as likely to have never married. Sixty-five percent of non-adopters have a high school degree or less, compared with less than one-third of credit card adopters (Table 1). Not surprisingly, there are also many significant differences in financial variables between credit card adopters and non-adopters (Table 2). On average, credit card adopters have higher household income, are twice as likely to own a home, and are less likely to use alternative financial services such as those offered by payday loan companies, pawn shops, or rent-to-own retailers. Eighty percent of credit card adopters could cover a \$2,000 emergency, compared with 33 percent of non-adopters. Only 3 percent of credit card adopters have a FICO score below 600, while 28 percent have a FICO score above 800. For non-adopters, the numbers are 26 percent and 3 percent, respectively. Credit card adopters have a significantly higher average financial literacy score: 2.27, compared with 1.58 for non-adopters.

5.2.3 Credit card revolvers versus non-revolvers

Tables 1 and 2 show that revolvers are less educated and more likely to be female, Black, or divorced. Income differences are not very large in magnitude (even though several are statistically significant), showing that cardholders in every income bracket are similarly likely to revolve. Differences in FICO scores are highly significant, which is not surprising because carrying unpaid credit card balances lowers a cardholder’s credit score. Revolvers are significantly more likely to have had a card account frozen, lost a job, or declared bankruptcy or foreclosure during the preceding 12 months. They are also more likely to use alternative financial services.

6. Regressions

In this section, we test whether the Big Five personality traits significantly affect financial behavior when we control for demographic and income variables. In various specifications, we estimate the probability of each of the three financial outcomes on just the demographic variables. We then add income and other financial variables. Finally, we add the Big Five personality traits. By running these regressions, we are able to separately measure the contribution of the personality traits, all else being equal.

We estimate the following three probit regressions:

$$\Pr(\text{unbanked}_i = 1) = U(\text{DEM}_i, \text{EMP}_i, \text{BIG5}_i, \text{INC}_i, \text{FIN}_i), \quad (1)$$

$$\Pr(\text{creditcard}_i = 1) = C(\text{DEM}_i, \text{EMP}_i, \text{BIG5}_i, \text{INC}_i, \text{FIN}_i, \text{STATE}_i), \quad (2)$$

$$\Pr(\text{revolve}_i = 1) = R(\text{DEM}_i, \text{EMP}_i, \text{BIG5}_i, \text{INC}_i, \text{FIN}_i, \text{STATE}_i), \quad (3)$$

where $\text{unbanked}_i = 1$ if consumer i does not have a bank account and 0 otherwise;

$\text{creditcard}_i = 1$ if consumer i has a credit card and 0 otherwise; and $\text{revolve}_i = 1$ if consumer i carried unpaid credit card debt in the last month and 0 otherwise (for credit card adopters only).

DEM_i is a vector of i 's demographic variables (age, education, gender, race, ethnicity, marital status, household size, urbanicity).¹⁰ EMP_i is a set of dummy variables for i 's employment status (employed, unemployed, retired, disabled/other). INC_i is a set of dummy variables indicating the cohort of i 's annual household income. BIG5_i is a set of variables measuring each of the Big Five personality traits (all five trait variables are scaled from 1 to 5; Appendix B includes a description of how the Big Five variables were constructed). FIN_i is a set of financial variables: i 's financial literacy score, which ranges from 0 to 3 (Appendix C includes a description of how the financial literacy score was constructed), whether i owns a home, and a dummy variable indicating whether i could cover an unexpected \$2,000 emergency expense. STATE_i are state fixed effects, which were included in Equations (2) and (3) but not in Equation (1) because in the

¹⁰ We include a age and a age^2 in the regressions, but when the marginal effects are calculated at the means for age, the coefficients on age and age^2 are combined.

sample, there are several states that have no unbanked consumers. In regressions, we use the unweighted values of all the variables, including the personality traits.

A. Probability of being unbanked

Table 4 displays the results of the Regression Equation (1). All the results are reported as the marginal effects at the means. Column (a) shows the regression results with demographics only. Although age has no statistically significant effect on the probability of being unbanked, education is highly significant: Compared with consumers who have less than a high school education, those with a high school degree have an 8.4 percentage point lower probability of being unbanked, and those with a graduate degree have a 13.1 percentage point lower probability of being unbanked. Unemployed or disabled consumers are more likely to be unbanked than those who are employed, and Black consumers have a 3.5 percentage point higher probability of being unbanked compared with white consumers.

Including the Big Five personality traits (column (b)) does not change these results. While being more conscientious slightly lowers the probability of being unbanked, none of the other traits is significant, and the effect of the demographic attributes remains unchanged. However, when we include income and other financial variables (column (c)), demographics become less important, and the financial variables significantly affect the probability of being unbanked. As can be expected, lower income consumers have a higher probability of being unbanked: Those with an annual household income of less than \$25,000 have a 2.6 percentage point higher probability of being unbanked compared with consumers whose annual household income is \$50,000 to \$75,000. Being able to cover a \$2,000 emergency expense, being a homeowner, or having a higher financial literacy score is associated with a lower probability of being unbanked. Adding the Big Five traits to demographics raises the pseudo R^2 by only 0.008, while adding income and financial variables to the demographics raises the pseudo R^2 by 0.088.

Estimating the probability of being unbanked on the personality traits alone yields some significant coefficients (Table 7); however, those effects disappear when demographic and financial characteristics are included in the regression (Table 4, column (d)).

B. Probability of being a credit card adopter

Table 5 displays the results of the Regression Equation (2). As before, all the results are reported as the marginal effects at the means. Most of the demographic variables significantly affect the

probability of having a credit card (column (a)). Note that although we observe whether a consumer has a credit card, we cannot distinguish whether the consumer never requested a card (demand-side reasons) from whether the consumer applied for a card but was denied (supply-side reasons).

Older consumers and more educated consumers are more likely to have a credit card. Compared with those with less than a high school education, consumers with a high school degree have a 17.6 percentage point higher probability of having a card, and those with a graduate degree have a 41.6 percentage point higher probability of being a credit card adopter. Unemployed or disabled consumers are significantly less likely to have a card than those who are employed, and Black consumers have a 12.9 percentage point lower probability of having a credit card compared with white consumers. Compared with people who are married, people who never married, are separated, or are divorced have a lower probability of adopting a credit card. Consumers living in urban areas are more likely than rural-area residents to have a card.

As with being unbanked, including the Big Five personality traits (column (b)) does not change these results. While being more agreeable slightly lowers the probability of adopting a credit card, none of the other traits is significant, and the effects of the demographic attributes remain unchanged. However, when we include income and other financial variables (column (c)), many coefficients on demographic variables become statistically insignificant, and others become much smaller in magnitude. The only exception is gender, which becomes statistically significant only when income and other financial variables are included: Men are less likely to have a credit card when we control for income and other financial variables. While the coefficients on education levels remain significant, their magnitude drops by half. Lusardi and Mitchell (2014) find that financial literacy is positively correlated with education, so including financial literacy reduces the effect of education in the regression.

Income and other financial variables significantly affect the probability of being a cardholder: Relative to consumers with an annual household income of \$50,000 to \$75,000, those who have a household income of less than \$25,000 have a 11.4 percentage point lower probability of adopting a credit card, and those with a household income or more than \$100,000 have a 7.7 percentage point higher probability. Being able to cover a \$2,000 emergency expense, being a homeowner, or having a higher financial literacy score are all associated with a higher

probability of having a credit card. Adding the Big Five traits to demographics raises the pseudo R^2 by only 0.002, whereas adding income and financial variables to the demographics raises the pseudo R^2 by 0.087. Thus, adding the financial variables raises the goodness of fit much more.

While estimating the probability of being a credit card adopter on the personality traits alone yields some significant coefficients (Table 7), those effects disappear when demographic and financial characteristics are included in the regression. The only exception is agreeableness, which remains significant when financial controls are included, although the level of significance drops.

C. Probability of revolving credit card debt

Table 6 shows the results of estimating Regression Equation (3). Only credit card adopters are included in the sample. The probability of revolving on a credit card is significantly affected by the Big Five personality traits, even when we control for many demographic and financial attributes. Column (d) shows that conscientiousness significantly lowers the probability of revolving. Both agreeableness and openness increase the probability of revolving. The coefficients can be interpreted as follows: Among credit card adopters, a one-point higher conscientiousness score is associated with a 6.1 percentage point lower probability of revolving, a one-point higher agreeableness score is associated with a 4.9 percentage point higher probability of revolving, and a one-point higher openness score is associated with a 5.1 percentage point higher probability of revolving. Since the personality traits are measured on a scale of 1 to 5, a one-point difference can be seen as a 25 percentage point change.

Being in either the lowest or highest income cohort lowers the probability of revolving. This finding is consistent with findings from previous research, which show that the middle-income cohorts are most likely to revolve credit card debt (Bertaut and Haliassos 2006). Cardholders who are retired, Asian, male, or living in urban areas are less likely to revolve, whereas Black consumers and divorced consumers are more likely to revolve. Being able to cover a \$2,000 emergency expense lowers the probability of revolving by 24.1 percentage points. In other words, credit card revolvers are unable to cover such a large emergency expense, which is consistent with findings in Greene and Stavins (2022).

A higher financial literacy score is associated with a lower likelihood of revolving, as can be expected. However, despite the strong, significant effects of many financial and demographic

variables, we find that personality traits also significantly affect the likelihood of credit card revolving. This result provides evidence that unlike other types of financial behavior, credit card revolving cannot be fully explained by other attributes and that including behavioral traits can help predict consumer behavior.

7. Conclusion

What determines consumers' financial behavior? Can income and demographic attributes explain why some consumers have a bank account or a credit card while others do not, or why some credit cardholders revolve their balances while others diligently pay their debts every month? Using detailed data collected from consumer surveys, we find that while demographics and income play significant roles in explaining financial outcomes, so do the consumer personality traits known as the Big Five in the literature. When we control for income and demographics, the personality traits become insignificant in predicting whether consumers are unbanked or whether they hold a credit card. However, the traits remain significant in predicting whether cardholders revolve their credit card debt: Credit card adopters who are less conscientious, more open, or more agreeable are significantly more likely to carry unpaid credit card debt. Future research could test whether personality traits can help predict more troublesome financial outcomes, such as delinquencies or bankruptcies.

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Table 1. Means of Demographic Variables by Banked, Credit Card Adopter, and Revolver Status

	All Respondents	Banked		Unbanked	Credit Card Adopter?			Among Credit Card Adopters, Revolver (last month)?		
		Banked	Unbanked		Yes	No		No	Yes	
Age	48.70	49.13	41.45	***	50.36	43.46	***	50.95	49.51	*
Age Cohort										
	<i>Under 25</i>	0.06	0.06	0.08	0.05	0.11	***	0.06	0.03	***
	<i>25-34</i>	0.23	0.22	0.36	0.21	0.28	***	0.21	0.22	
	<i>35-44</i>	0.16	0.16	0.19	0.16	0.18		0.15	0.16	
	<i>45-54</i>	0.16	0.16	0.16	0.16	0.15		0.13	0.20	***
	<i>55-64</i>	0.17	0.17	0.14	0.17	0.15		0.16	0.19	*
	<i>65+</i>	0.23	0.24	0.08	0.26	0.13	***	0.29	0.20	***
Education										
	<i>Less Than High School</i>	0.07	0.06	0.35	0.04	0.19	***	0.03	0.05	
	<i>High School</i>	0.32	0.31	0.47	0.27	0.46	***	0.25	0.30	*
	<i>Some College</i>	0.17	0.17	0.10	0.16	0.18		0.14	0.20	***
	<i>College</i>	0.29	0.30	0.07	0.33	0.14	***	0.36	0.30	***
	<i>Graduate</i>	0.16	0.17	0.01	0.20	0.03	***	0.23	0.16	***
Gender										
	<i>Male</i>	0.48	0.48	0.45	0.47	0.51		0.52	0.41	***
	<i>Female</i>	0.52	0.52	0.55	0.53	0.49		0.48	0.59	***
Ethnicity										
	<i>Latino</i>	0.11	0.11	0.18	0.10	0.14	*	0.09	0.12	*
	<i>Non-Latino</i>	0.89	0.89	0.82	0.90	0.86	*	0.91	0.88	*
Race										
	<i>White</i>	0.71	0.72	0.55	0.74	0.65	***	0.75	0.71	*
	<i>Black</i>	0.14	0.12	0.37	0.10	0.24	***	0.06	0.16	***
	<i>Asian</i>	0.05	0.06	0.02	0.07	0.02	***	0.10	0.02	***
	<i>Other</i>	0.09	0.10	0.05	0.09	0.09		0.09	0.11	
Work Status										
	<i>Employed</i>	0.56	0.58	0.28	0.61	0.42	***	0.58	0.64	***
	<i>Unemployed</i>	0.07	0.06	0.24	0.04	0.17	***	0.03	0.05	
	<i>Retired</i>	0.17	0.18	0.04	0.20	0.09	***	0.24	0.13	***
	<i>Disabled/other</i>	0.19	0.18	0.43	0.16	0.32	***	0.14	0.17	*
Marital Status										
	<i>Married</i>	0.54	0.56	0.30	0.59	0.38	***	0.61	0.57	**
	<i>Separated</i>	0.02	0.01	0.07	0.01	0.04	***	0.01	0.01	
	<i>Divorced</i>	0.13	0.13	0.12	0.12	0.14		0.09	0.17	***
	<i>Widowed</i>	0.06	0.06	0.04	0.06	0.04	**	0.06	0.06	
	<i>Never Married</i>	0.26	0.24	0.48	0.21	0.40	***	0.22	0.20	
Urbanicity										
	<i>Rural</i>	0.18	0.18	0.16	0.17	0.20		0.16	0.19	*
	<i>Mixed</i>	0.53	0.53	0.47	0.53	0.53		0.52	0.53	
	<i>Urban</i>	0.30	0.29	0.37	0.30	0.27		0.32	0.28	**
Number of Respondents	3,969	3,748	218		3,020	948		1,784	1,233	
Percent of Respondents	100	94.51	5.49		76.12	23.88		59.13	40.87	

Note: Results are weighted. Stars indicate the result of a t-test for difference in mean between the two groups: * p < 0.10, ** p < 0.05, *** p < 0.01. Source: 2021 DCPC.

Table 2. Means of Financial and Personality Variables by Banked, Credit Card Adopter, and Revolver Status

	All Respondents			Credit Card Adopter?			Among Credit Card Adopters, Revolver (last month)?		
		Banked	Unbanked	Yes	No		No	Yes	
Income	<i>Less than \$25,000</i>	0.21	0.18	0.69 ***	0.13	0.46 ***		0.13	0.14
	<i>\$25,000–\$49,999</i>	0.18	0.19	0.13 *	0.17	0.21 *		0.14	0.23 ***
	<i>\$50,000–\$74,999</i>	0.16	0.16	0.10 *	0.17	0.14 *		0.15	0.19 **
	<i>\$75,000–\$99,999</i>	0.13	0.14	0.05 ***	0.14	0.11 *		0.14	0.15
	<i>More than \$100,000</i>	0.31	0.32	0.03 ***	0.38	0.08 ***		0.44	0.29 ***
Home Ownership	<i>Homeowner</i>	0.63	0.65	0.21 ***	0.71	0.37 ***		0.73	0.67 ***
	<i>Non-homeowner</i>	0.37	0.35	0.79 ***	0.29	0.63 ***		0.27	0.33 ***
FICO Score	<i><600</i>	0.09	0.07	0.35 ***	0.03	0.26 ***		0.02	0.05 ***
	<i>600–649</i>	0.10	0.10	0.11	0.09	0.14 ***		0.03	0.16 ***
	<i>650–699</i>	0.10	0.10	0.05 **	0.09	0.11		0.04	0.17 ***
	<i>700–749</i>	0.16	0.17	0.02 ***	0.19	0.06 ***		0.16	0.25 ***
	<i>750–800</i>	0.21	0.22	0.03 ***	0.26	0.06 ***		0.29	0.21 ***
	<i>>800</i>	0.22	0.23	0.01 ***	0.28	0.03 ***		0.39	0.12 ***
Financial literacy score (0 to 3)	2.11	2.16	1.14 ***	2.27	1.58 ***		2.40	2.10 ***	
In the past 12 months	<i>credit card frozen</i>	0.021	0.018	0.070 **	0.017	0.035 **		0.012	0.024 *
	<i>lost job</i>	0.029	0.029	0.035	0.022	0.051 ***		0.016	0.032 **
	<i>declared bankruptcy</i>	0.022	0.022	0.020	0.018	0.037 **		0.011	0.027 **
	<i>foreclosure</i>	0.020	0.019	0.039	0.018	0.028		0.010	0.029 ***
In the past 12 months (financial services)	<i>payday loan</i>	0.008	0.008	0.015	0.004	0.021 ***		0.003	0.005
	<i>pawn shop</i>	0.015	0.014	0.037	0.010	0.034 ***		0.007	0.013
	<i>rent-to-own</i>	0.018	0.015	0.064 *	0.010	0.042 ***		0.004	0.020 ***
	<i>auto title loan</i>	0.007	0.007	0.004	0.006	0.012		0.002	0.010 *
	<i>tax refund anticipation loan any of the above</i>	0.015	0.013	0.049 **	0.013	0.022		0.009	0.019
	0.056	0.052	0.134 **	0.040	0.108 ***		0.023	0.065 ***	
Checking Account Balance	5,786.37	5,786.37	0.00	6,720.46	1,825.99 ***		9,698.95	2,490.03 ***	
Cash Balance	68.10	69.22	50.18	75.31	45.34 ***		85.64	60.50 ***	
Could cover a \$2,000 emergency ... with liquid assets	0.69	0.72	0.12 ***	0.80	0.33 ***		0.88	0.67 ***	
	0.49	0.52	0.06 ***	0.58	0.22 ***		0.68	0.43 ***	
Big Five Personality (1 to 5)	<i>Extroversion</i>	3.17	3.17	3.12	3.19	3.12		3.18	3.19
	<i>Agreeableness</i>	3.93	3.94	3.71 ***	3.95	3.86 **		3.93	3.97
	<i>Conscientiousness</i>	3.94	3.96	3.55 ***	3.99	3.78 ***		4.00	3.97
	<i>Neuroticism</i>	2.71	2.70	2.88 ***	2.66	2.86 ***		2.63	2.70 *
	3.51	3.52	3.33 ***	3.52	3.45 **		3.51	3.54	
Number of Respondents	3,969	3,748	218	3,020	948		1,784	1,233	
Percent of Respondents	100	94.51	5.49	76.12	23.88		59.13	40.87	

Note: Results are weighted. Stars indicate the result of a t-test for difference in mean between the two groups: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Source: 2021 DCPC merged with UAS 237 (Big Five personality, financial literacy).

Table 3. Correlation Coefficients Between Big Five Personality Traits and Demographic Variables

		Extroversion	Agreeableness	Conscientiousness	Neuroticism	Openness			
Age		0.065 ***	0.180 ***	0.206 ***	-0.203 ***	0.001			
Age Cohort	<i>Under 25</i>	-0.018	-0.047 **	-0.121 ***	0.112 ***	0.010			
	<i>25-34</i>	-0.053 **	-0.135 ***	-0.173 ***	0.126 ***	-0.033			
	<i>35-44</i>	-0.019	-0.014	0.007	0.017	0.021			
	<i>45-54</i>	0.037 *	-0.001	0.058 ***	-0.006	-0.009			
	<i>55-64</i>	0.000	0.026	0.089 ***	-0.080 ***	0.000			
	<i>65+</i>	0.049 **	0.152 ***	0.106 ***	-0.129 ***	0.017			
Education	<i>Less Than High School</i>	-0.001	-0.045 *	-0.089 ***	0.063 ***	-0.090 ***			
	<i>High School</i>	-0.005	0.018	-0.038	0.094 ***	-0.123 ***			
	<i>Some College</i>	0.027	0.021	-0.003	-0.039 **	0.018			
	<i>College</i>	-0.027	-0.027	0.038 *	-0.032	0.047 **			
	<i>Graduate</i>	0.013	0.023	0.068 ***	-0.087 ***	0.145 ***			
Gender	<i>Male</i>	-0.018	-0.159 ***	-0.066 ***	-0.138 ***	0.004			
	<i>Female</i>	0.018	0.159 ***	0.066 ***	0.138 ***	-0.004			
Ethnicity	<i>Latino</i>	0.035	0.017	0.021	0.014	0.045 *			
	<i>Non-Latino</i>	-0.035	-0.017	-0.021	-0.014	-0.045 *			
Race	<i>White</i>	0.006	-0.014	-0.021	0.114 ***	-0.082 ***			
	<i>Black</i>	0.040 *	0.061 **	0.026	-0.104 ***	0.020			
	<i>Asian</i>	-0.035	-0.040 *	-0.056 **	-0.019	0.023			
	<i>Other</i>	-0.028	-0.017	0.047 **	-0.042 *	0.085 ***			
Work Status	<i>Employed</i>	0.017	-0.014	0.053 **	-0.032	-0.021			
	<i>Unemployed</i>	-0.009	-0.052 **	-0.093 ***	0.072 ***	0.054 **			
	<i>Retired</i>	0.022	0.108 ***	0.108 ***	-0.122 ***	-0.016			
	<i>Disabled/other</i>	-0.039 *	-0.052 **	-0.112 ***	0.113 ***	0.006			
Marital Status	<i>Married</i>	0.050 **	-0.024	0.081 ***	-0.099 ***	-0.075 ***			
	<i>Separated</i>	0.007	-0.020	-0.003	0.025	0.040 *			
	<i>Divorced</i>	0.016	0.101 ***	0.063 ***	-0.054 **	0.055 ***			
	<i>Widowed</i>	0.032	0.091 ***	0.055 ***	-0.032 *	-0.050 **			
	<i>Never Married</i>	-0.088 ***	-0.091 ***	-0.167 ***	0.162 ***	0.059 ***			
Urbanicity	<i>Rural</i>	-0.029	0.011	0.000	-0.002	-0.098 ***			
	<i>Mixed</i>	-0.009	0.000	-0.014	0.025	-0.013			
	<i>Urban</i>	0.033	-0.009	0.016	-0.026	0.096 ***			

Note: Results are weighted. Stars indicate the significance of the correlation between the personality trait and the demographic or financial variable variables: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Source: 2021 DCPC merged with UAS 237 (Big Five personality).

Table 3, cont'd. Correlation Coefficients Between Big Five Personality Traits and Financial Variables

	Extroversion	Agreeableness	Conscientiousness	Neuroticism	Openness
Income (\$)	0.060 ***	-0.030 *	0.046 *	-0.050 **	0.042 *
Income					
<i>Less than \$25,000</i>	-0.023	-0.017	-0.075 ***	0.039 *	-0.011
<i>\$25,000–\$49,999</i>	-0.030	0.039 *	-0.021	0.032	-0.020
<i>\$50,000–\$74,999</i>	0.002	0.008	-0.014	-0.025	-0.018
<i>\$75,000–\$99,999</i>	-0.008	0.015	0.000	0.000	-0.026
<i>More than \$100,000</i>	0.050 **	-0.036 *	0.093 ***	-0.042 **	0.059 ***
Home Ownership					
<i>Homeowner</i>	0.028	0.088 ***	0.161 ***	-0.126 ***	-0.021
<i>Non-homeowner</i>	-0.028	-0.088 ***	-0.161 ***	0.126 ***	0.021
FICO Score					
<i><600</i>	0.048 **	-0.016	-0.048 **	0.058 ***	-0.008
<i>600–649</i>	0.028	0.030	-0.018	0.042 *	-0.020
<i>650–699</i>	0.028	0.016	-0.024	0.010	0.008
<i>700–749</i>	0.010	0.004	-0.011	0.001	0.026
<i>750–800</i>	-0.018	0.006	0.070 ***	-0.036 *	0.011
<i>>800</i>	-0.017	0.031	0.103 ***	-0.092 ***	0.006
Financial literacy score (0 to 3)	-0.020	-0.015	0.073 ***	-0.081 ***	0.083 ***
In the past 12 months					
<i>credit card frozen</i>	-0.006	0.012	-0.043 **	0.041 **	0.003
<i>lost job</i>	-0.028	-0.020	-0.034	0.035	0.031
<i>declared bankruptcy</i>	-0.004	0.000	-0.015	0.031	0.010
<i>foreclosure</i>	0.002	0.024	-0.013	0.055 **	0.035
In the past 12 months (financial services)					
<i>payday loan</i>	0.005	-0.016	-0.027	0.027 *	0.001
<i>pawn shop</i>	0.062 ***	0.006	0.010	-0.002	0.040 *
<i>rent-to-own</i>	-0.017	-0.031	-0.049 **	0.055 **	-0.045 *
<i>auto title loan</i>	0.015	0.028	-0.003	-0.004	-0.013
<i>tax refund anticipation loan</i>	0.005	-0.037 *	-0.083 ***	0.068 ***	-0.032
<i>any of the above</i>	0.027	-0.029	-0.059 **	0.072 ***	-0.010
Checking account balance	-0.007	-0.017	0.048 ***	-0.006	0.009
Cash balance	-0.012	0.018	0.054 ***	-0.077 ***	-0.010
Could cover a \$2,000 emergency ... with liquid assets	-0.017	0.036	0.124 ***	-0.118 ***	0.051 **
	-0.010	0.027	0.104 ***	-0.087 ***	0.042 **

Note: Results are weighted. Stars indicate the significance of the correlation between the variables: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Source: 2021 DCPC merged with UAS 237 (Big Five personality, financial literacy).

Table 4. Probability of Being Unbanked, Probit

	(a)	(b)	(c)	(d)
Age	-0.0004	-0.0003	-0.0001	-0.0001
Education				
<i>Less Than High School</i>	-- --	-- --	-- --	-- --
<i>High School</i>	-0.084 ***	-0.079 ***	-0.021 *	-0.020
<i>Some College</i>	-0.117 ***	-0.107 ***	-0.027 **	-0.025 *
<i>College</i>	-0.129 ***	-0.118 ***	-0.030 **	-0.028 **
<i>Graduate</i>	-0.131 ***	-0.119 ***	-0.030 **	-0.027 *
Gender				
<i>Male</i>	-0.004	-0.004	0.001	0.000
<i>Female</i>	-- --	-- --	-- --	-- --
Work Status				
<i>Unemployed</i>	0.035 **	0.032 **	0.005	0.004
<i>Retired</i>	-0.002	-0.002	-0.002	-0.001
<i>Disabled/other</i>	0.033 ***	0.027 ***	0.008 *	0.006
<i>Employed</i>	-- --	-- --	-- --	-- --
Ethnicity				
<i>Latino</i>	0.020	0.021	0.008	0.007
<i>Non-Latino</i>	-- --	-- --	-- --	-- --
Race				
<i>Black</i>	0.035 **	0.037 ***	0.003	0.003
<i>Asian</i>	-0.003	-0.002	0.001	0.001
<i>Other</i>	-0.007	-0.005	-0.003	-0.003
<i>White</i>	-- --	-- --	-- --	-- --
Marital Status				
<i>Separated</i>	0.052 *	0.056 *	0.010	0.012
<i>Divorced</i>	0.023 **	0.024 **	0.004	0.004
<i>Widowed</i>	0.012	0.011	0.001	0.000
<i>Never Married</i>	0.042 ***	0.041 ***	0.012 *	0.012 *
<i>Married</i>	-- --	-- --	-- --	-- --
Urbanicity				
<i>Urban</i>	-0.007	-0.007	-0.002	-0.002
<i>Mixed</i>	-0.005	-0.004	-0.002	-0.002
<i>Rural</i>	-- --	-- --	-- --	-- --
Household size	0.002 **	0.002 **	0.001 **	0.001 *
Big Five Personality (1 to 5)				
<i>Extroversion</i>		0.001		0.001
<i>Agreeableness</i>		0.000		0.000
<i>Conscientiousness</i>		-0.007 **		-0.003
<i>Neuroticism</i>		0.000		0.000
<i>Openness</i>		-0.004		-0.002
Could cover \$2,000 emergency expense			-0.010 **	-0.009 *
Income				
<i>Less than \$25,000</i>			0.026 ***	0.027 ***
<i>\$25,000-\$49,999</i>			0.010 *	0.010 *
<i>\$50,000-\$74,999</i>			-- --	-- --
<i>\$75,000-\$99,999</i>			0.004	0.002
<i>More than \$100,000</i>			-0.004	-0.004
Home Ownership				
<i>Homeowner</i>			-0.008 *	-0.007 *
<i>Non-homeowner</i>			-- --	-- --
Financial literacy score (0 to 3)			-0.003 **	-0.003 **
Pseudo R-Squared	0.284	0.292	0.372	0.377
Number of Respondents	3,401	3,334	3,343	3,304

Note: Results are reported as marginal effects at means, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. "--" denotes the reference group. Source: 2021 DCPC merged with UAS 237 (Big Five personality, financial literacy).

Table 5. Probability of Being a Credit Card Adopter, Probit

	(a)	(b)	(c)	(d)
Age	0.0037 ***	0.0035 ***	0.0028 ***	0.0027 ***
Education				
<i>Less Than High School</i>	-- --	-- --	-- --	-- --
<i>High School</i>	0.176 ***	0.165 ***	0.100 **	0.097 **
<i>Some College</i>	0.267 ***	0.261 ***	0.142 ***	0.145 ***
<i>College</i>	0.351 ***	0.342 ***	0.175 ***	0.176 ***
<i>Graduate</i>	0.416 ***	0.404 ***	0.221 ***	0.223 ***
Gender				
<i>Male</i>	-0.005	-0.014	-0.029 **	-0.033 **
<i>Female</i>	-- --	-- --	-- --	-- --
Work Status				
<i>Unemployed</i>	-0.212 ***	-0.198 ***	-0.099 ***	-0.089 ***
<i>Retired</i>	-0.029	-0.030	-0.015	-0.014
<i>Disabled/other</i>	-0.130 ***	-0.128 ***	-0.058 ***	-0.057 ***
<i>Employed</i>	-- --	-- --	-- --	-- --
Ethnicity				
<i>Latino</i>	-0.038	-0.042	0.009	0.006
<i>Non-Latino</i>	-- --	-- --	-- --	-- --
Race				
<i>Black</i>	-0.129 ***	-0.139 ***	-0.032	-0.040
<i>Asian</i>	0.020	0.030	0.039	0.034
<i>Other</i>	-0.033	-0.042	-0.024	-0.027
<i>White</i>	-- --	-- --	-- --	-- --
Marital Status				
<i>Separated</i>	-0.165 **	-0.153 **	-0.030	-0.022
<i>Divorced</i>	-0.099 ***	-0.094 ***	-0.021	-0.016
<i>Widowed</i>	-0.054	-0.045	0.010	0.016
<i>Never Married</i>	-0.093 ***	-0.093 ***	-0.012	-0.012
<i>Married</i>	-- --	-- --	-- --	-- --
Urbanicity				
<i>Urban</i>	0.047 **	0.045 **	0.028	0.028
<i>Mixed</i>	0.010	0.010	-0.006	-0.005
<i>Rural</i>	-- --	-- --	-- --	-- --
Household size	-0.006 *	-0.006 *	-0.007 **	-0.007 **
Big Five Personality (1 to 5)				
<i>Extroversion</i>		0.006		0.008
<i>Agreeableness</i>		-0.032 ***		-0.021 *
<i>Conscientiousness</i>		0.013		0.002
<i>Neuroticism</i>		-0.016		-0.007
<i>Openness</i>		0.004		-0.001
Could cover \$2,000 emergency expense			0.113 ***	0.114 ***
Income				
<i>Less than \$25,000</i>			-0.114 ***	-0.111 ***
<i>\$25,000-\$49,999</i>			-0.043 *	-0.042 *
<i>\$50,000-\$74,999</i>			-- --	-- --
<i>\$75,000-\$99,999</i>			0.030	0.029
<i>More than \$100,000</i>			0.077 ***	0.073 ***
Home Ownership			0.086 ***	0.086 ***
<i>Homeowner</i>			-- --	-- --
<i>Non-homeowner</i>			-- --	-- --
Financial literacy score (0 to 3)			0.027 ***	0.026 ***
Pseudo R-Squared	0.225	0.227	0.312	0.311
Number of Respondents	3,372	3,307	3,314	3,277

Note: Results are reported as marginal effects at means, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. "--" denotes the reference group. State fixed effects included in all specifications. Source: 2021 DCPC merged with UAS 237 (Big Five personality, financial literacy).

Table 6. Probability of Positive Revolving Balance Last Month Among Credit Card Adopters, Probit

	(a)	(b)	(c)	(d)
Age	-0.0014	-0.0013	-0.0002	-0.0003
Education				
<i>Less Than High School</i>	-- --	-- --	-- --	-- --
<i>High School</i>	-0.077	-0.082	-0.036	-0.039
<i>Some College</i>	-0.028	-0.023	0.048	0.045
<i>College</i>	-0.121 *	-0.119 *	-0.006	-0.010
<i>Graduate</i>	-0.146 **	-0.149 **	-0.004	-0.018
Gender				
<i>Male</i>	-0.088 ***	-0.081 ***	-0.066 ***	-0.061 ***
<i>Female</i>	-- --	-- --	-- --	-- --
Work Status				
<i>Unemployed</i>	0.008	-0.019	-0.072	-0.088
<i>Retired</i>	-0.153 ***	-0.154 ***	-0.169 ***	-0.169 ***
<i>Disabled/other</i>	-0.039	-0.052 *	-0.081 ***	-0.094 ***
<i>Employed</i>	-- --	-- --	-- --	-- --
Ethnicity				
<i>Latino</i>	0.108 **	0.106 **	0.067	0.065
<i>Non-Latino</i>	-- --	-- --	-- --	-- --
Race				
<i>Black</i>	0.235 ***	0.246 ***	0.166 ***	0.180 ***
<i>Asian</i>	-0.231 ***	-0.231 ***	-0.254 ***	-0.254 ***
<i>Other</i>	0.024	0.023	-0.003	-0.003
<i>White</i>	-- --	-- --	-- --	-- --
Marital Status				
<i>Separated</i>	0.058	0.046	-0.043	-0.058
<i>Divorced</i>	0.191 ***	0.178 ***	0.136 ***	0.124 ***
<i>Widowed</i>	0.051	0.047	0.016	0.013
<i>Never Married</i>	0.063 *	0.044	-0.002	-0.020
<i>Married</i>	-- --	-- --	-- --	-- --
Urbanicity				
<i>Urban</i>	-0.097 ***	-0.102 ***	-0.081 **	-0.084 **
<i>Mixed</i>	-0.046 *	-0.048 *	-0.039	-0.041
<i>Rural</i>	-- --	-- --	-- --	-- --
Household size	0.016 **	0.017 ***	0.018 ***	0.017 ***
Big Five Personality (1 to 5)				
<i>Extroversion</i>		-0.008		-0.009
<i>Agreeableness</i>		0.056 ***		0.049 **
<i>Conscientiousness</i>		-0.069 ***		-0.061 ***
<i>Neuroticism</i>		0.018		0.010
<i>Openness</i>		0.046 ***		0.051 ***
Could cover \$2,000 emergency expense			-0.237 ***	-0.241 ***
Income				
<i>Less than \$25,000</i>			-0.120 ***	-0.117 ***
<i>\$25,000-\$49,999</i>			0.009	0.011
<i>\$50,000-\$74,999</i>			-- --	-- --
<i>\$75,000-\$99,999</i>			-0.002	-0.002
<i>More than \$100,000</i>			-0.124 ***	-0.115 ***
Home Ownership				
<i>Homeowner</i>			-0.078 ***	-0.075 **
<i>Non-homeowner</i>			-- --	-- --
Financial literacy score (0 to 3)			-0.039 ***	-0.039 ***
Pseudo R-Squared	0.102	0.107	0.140	0.146
Number of Respondents	2,756	2,710	2,710	2,688

Note: Results are reported as marginal effects at means, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. "--" denotes the reference group. Sample restricted to credit card adopters. State fixed effects included in all specifications. Source: 2021 DCPC merged with UAS 237 (Big Five personality, financial literacy).

Table 7. Probit Regressions Which Only Use Personality Traits to Predict Financial Behavior

Dependent Variable	Unbanked	Credit card adopter	Positive revolving balance last month
Big Five Personality (1 to 5)			
<i>Extroversion</i>	0.008 *	-0.011	0.013
<i>Agreeableness</i>	0.005	-0.041 ***	0.078 ***
<i>Conscientiousness</i>	-0.028 ***	0.059 ***	-0.060 ***
<i>Neuroticism</i>	0.010 **	-0.048 ***	0.051 ***
<i>Openness</i>	-0.009 *	0.020 *	0.016
Pseudo R-Squared	0.041	0.024	0.011
Number of Respondents	3,889	3,890	3,140

Note: Results are reported as marginal effects at means, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Sample restricted to credit card adopters for positive revolving balance last month regression. Source: 2021 DCPC merged with UAS 237 (Big Five personality).

Appendix A: Machine Learning Algorithm

The machine learning (ML) analysis allows us to rank the influence of the personality traits on the financial outcomes, rather than showing which traits are statistically significant, as regressions do. Thus, the ML trees add to the evidence found in regressions.

Bank account adoption

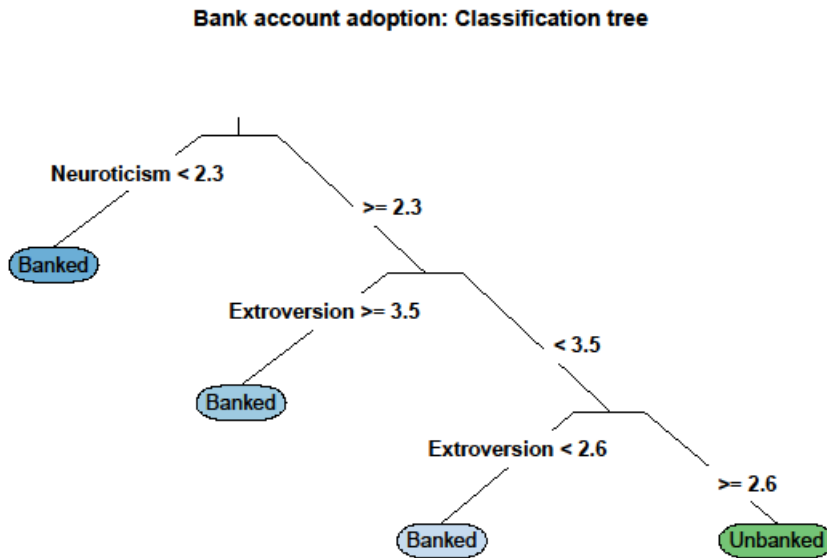
An ML model shows that a higher degree of neuroticism is related to unbanked status. The classification tree in Figure 1 was generated by an ML technique that splits and classifies survey respondents according to their bank account status, with the objective of minimizing the number of classification errors.¹¹

Figure 1 shows that neuroticism is the trait most determinative of bank account adoption. The classification tree algorithm selects neuroticism as the top split, meaning that on a scale of 1 to 5, the split at the neuroticism score of 2.3 reduces classification errors more than any other trait and any other threshold neuroticism level. The algorithm selects extroversion as the second split, indicating that extroversion and the split at 3.5 reduce classification errors more than the remaining three Big Five traits.¹²

¹¹ Note that classification error refers to the algorithm's classification prediction (banked or unbanked) versus the banking status behavior that is actually observed in the sample. The classification trees in this article are constructed with the rpart R-package. The classification trees presented in this article are somewhat smaller (fewer branches) than the optimal trees that are used for prediction purposes and are used here for the sake of illustrating the role traits may play in financial behavior.

¹² The raw sample includes 3,791 banked and 174 unbanked respondents. Machine learning algorithms tend to perform poorly when the minority class (unbanked) is very small. For this reason, Figure 1 is drawn using a synthetic sample with an equal number of 522 banked and 522 unbanked individuals. The synthetic data were constructed from the raw sample with the performanceEstimation R-package.

Figure 1: Personality Traits Associated with Unbanked and Banked Consumers



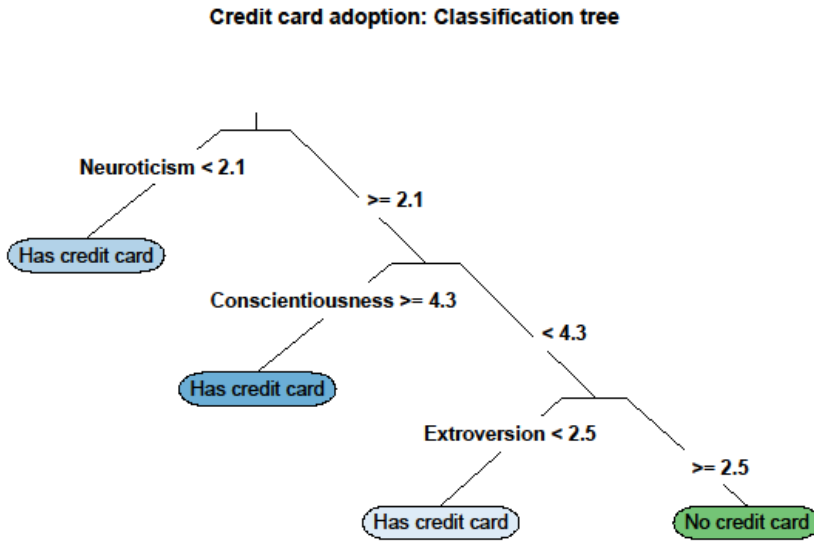
Note: Classification trees are generated by a machine learning technique that displays an optimized algorithm in the form of an upside-down classification tree. The tree illustrates how the software splits and classifies survey respondents to minimize the number of classification errors. Each personality trait is scaled to be measured from 1 to 5. Source: Authors' analysis.

Credit card adoption

A machine learning classification algorithm finds two traits, conscientiousness and neuroticism, to be the most determinative of credit card adoption. Figure 2 shows that on the scale of 1 to 5, the split at the 2.1 level of neuroticism reduces classification errors more than any other trait and any other threshold neuroticism level. The algorithm selects conscientiousness as the second split, indicating that conscientiousness and the split at 4.3 reduce classification errors more than the remaining three Big Five traits.¹³

¹³ In the raw sample, 3,199 respondents have a credit card, and 767 do not have a credit card. Machine learning algorithms tend to perform poorly when the minority class (not having a credit card) is very small. For this reason, Figure 2 is drawn using a synthetic sample with 2,297 respondents who have a credit card and 2,301 who do not have a credit card.

Figure 2: Personality Traits Associated with Having (Adopting) a Credit Card



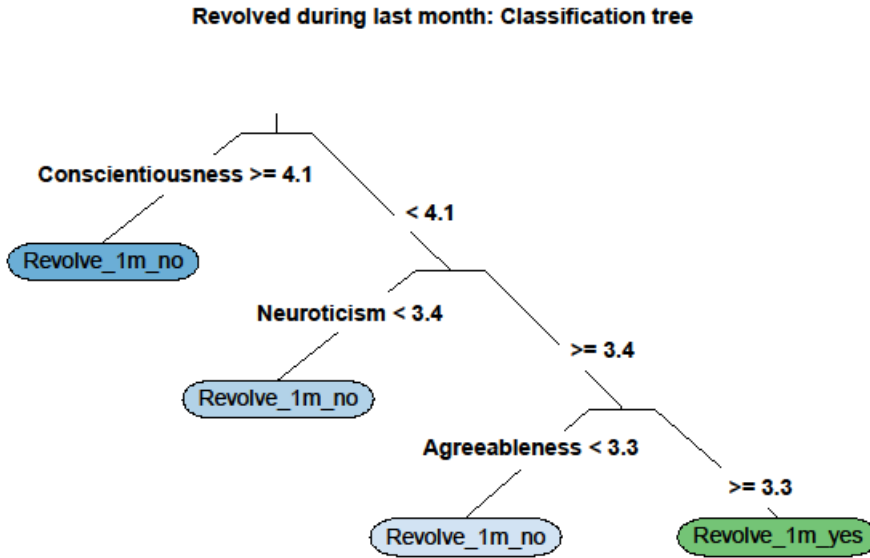
Note: Classification trees are generated by a machine learning technique that displays an optimized algorithm in the form of an upside-down classification tree. The tree illustrates how the software splits and classifies survey respondents to minimize the number of classification errors. Each personality trait is scaled to be measured from 1 to 5. Source: Authors' analysis.

Credit card revolving

The machine learning classification tree (Figure 3) shows conscientiousness as the top split for separating credit card revolvers from non-revolvers. On the scale of 1 to 5, the split at 4.1 reduces classification errors more than any other trait and any other threshold conscientiousness level. The algorithm selects neuroticism as the second split indicating that neuroticism and the

split at 3.4 reduce classification errors more than the other Big Five traits. Agreeableness comes third in terms of error reduction.¹⁴

Figure 3: Personality Traits That Influence Credit Card Revolving



Note: Classification trees are generated by a machine learning technique that displays an optimized algorithm in the form of an upside-down classification tree. The tree illustrates how the software splits and classifies survey respondents to minimize the number of classification errors. Each personality trait is rescaled to be measured from 1 to 5. Source: Authors' analysis.

¹⁴ The tree is constructed from the raw sample of credit cardholders, which includes 1,326 respondents who revolved during the preceding month and 1,867 who did not revolve.

Appendix B: Self-reported Personality Traits

Data source: UAS 237, fielded from April 3, 2020, through October 18, 2022

Respondents rate their answer to each question on a scale of 1 to 5 (disagree to agree). We use those numerical responses to calculate the average rating for each trait. As a result, each personality trait in the data ranges from 1 to 5.

I am someone who ...

Openness

1. Is original, comes up with new ideas
2. Is curious about many different things
3. Is ingenious, a deep thinker
4. Has an active imagination
5. Is inventive
6. Values artistic, aesthetic experiences
7. Prefers work that is routine (reverse score)
8. Likes to reflect, play with ideas
9. Has few artistic interests (reverse score)
10. Is sophisticated in art, music, or literature

Conscientiousness

1. Does a thorough job
2. Can be somewhat careless (reverse score)
3. Is a reliable worker
4. Tends to be disorganized (reverse score)
5. Tends to be lazy (reverse score)
6. Perseveres until the task is finished
7. Does things efficiently
8. Makes plans and follows through with them
9. Is easily distracted (reverse score)

Extroversion

1. Is talkative
2. Is reserved (reverse score)
3. Is full of energy
4. Generates a lot of enthusiasm
5. Tends to be quiet (reverse score)
6. Has an assertive personality
7. Is sometimes shy, inhibited (reverse score)
8. Is outgoing, sociable

Agreeableness

1. Tends to find fault with others (reverse score)
2. Is helpful and unselfish with others
3. Starts quarrels with others (reverse score)
4. Has a forgiving nature
5. Is generally trusting
6. Can be cold and aloof (reverse score)
7. Is considerate and kind to almost everyone
8. Is sometimes rude to others (reverse score)
9. Likes to cooperate with others

Neuroticism

1. Is depressed, blue
2. Is relaxed, handles stress well (reverse score)
3. Can be tense
4. Worries a lot
5. Is emotionally stable, not easily upset (reverse score)
6. Can be moody
7. Remains calm in tense situations (reverse score)
8. Gets nervous easily

Appendix C: Financial Literacy Score

We construct a financial literacy score based on responses to three questions asked in the UAS survey that were originally posed in Lusardi, Mitchell, and Curto (2009) and Lusardi and Mitchell (2006, 2008). These questions have been added to surveys in the United States and elsewhere. The score, measuring the number of correct answers, ranges from 0 to 3.

UAS 237 L001 (interest rate)

1. Suppose you had \$100 in a savings account and the interest rate was 2% per year. After five years, how much do you think you would have in the account if you left the money to grow: more than \$102, exactly \$102, less than \$102?

- (1) More than \$102
- (2) Exactly \$102
- (3) Less than \$102
- (4) I don't know

UAS 237 L005 (inflation)

2. Suppose that in the year 2022, your income has doubled and prices of all goods have doubled, too. In 2022, will you be able to buy more, the same, or less than today with your income?

- (1) Buy more than today
- (2) Buy the same as today
- (3) Buy less than today
- (4) I don't know

UAS P002 (risk)

3. Do you think the following statement is true? Buying a single company's stock usually provides a safer return than a stock mutual fund.

- (1) True
- (2) False
- (3) I don't know