The Big Five Personality Traits
and Borrowing Behavior

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Abstract

The importance of the Big Five personality traits (openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism) has been acknowledged in studies on financial decision-making, including borrowing behavior. However, there has been limited discussion on this topic in the context of developing economies, which comprise a significant proportion of the world's population and where financial exclusion is an issue. This study aims to examine the role of the Big Five personality traits on borrowing behavior, measured by intention to borrow and loan to annual income ratio, by using the data from the 2014 Indonesia Family Life Survey (IFLS). The results of probit and ordinary least squares (OLS) regression

techniques show that, among the elements of the Big Five personality traits, openness to experience and extraversion seem to be the most important due to their significant effects on intention to borrow, and, therefore, financial inclusion efforts should incorporate these two personality factors.

1. Introduction

Following the emergence of behavioral theories in economics, which basically emphasize the importance of psychological factors in decision-making, several studies have argued that the Big Five personality traits provide a comprehensive view of one's personality traits. It consists of five main individual traits, namely openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism, and its stability over the life cycle has been acknowledged. The uniqueness of this set of traits and its measures' validity have been investigated empirically (Goldberg, 1990; Costa & McRae, 1992). Cobb-Clark and Schurer (2012) also show that these traits tend to be stable over the lifetime. Studies have tried to examine the impact of the Big Five personality traits on several economic outcomes, including earnings, money management, and employment (see among others: Caliendo, Fossen, & Kritikos, 2014; Donnelly, Iyer, & Howell, 2012; Heineck & Anger, 2010).

Borrowing is one important element of financial behavior, as excessive indebtedness might have a detrimental impact on one's mental health (Harrison & Chudry, 2011). Thus, studies have examined the relationships between the Big Five personality traits and borrowing behavior. Specifically, this issue has been specifically investigated by Nyhus and Webley (2001) in the case of a Dutch sample, where the study highlights the roles of emotional stability, autonomy, and extraversion. In a similar context, Pinjisakikool (2018) finds the indirect effect of the Big Five personality traits

in predicting financial behavior. Brown and Taylor (2014) similarly show how extraversion and openness to experience have significant correlations with the levels of debt and assets held.

Despite these existing studies, contextual factors should be considered as the nexus between psychological factors and borrowing behavior may not be similar in different settings. Gerhard, Gladstone, and Hoffmann (2018) have shown that heterogeneity across different groups in society might affect the nature of the relationships between psychology factors and financial behavior. Empirically, while it was shown that neuroticism has negative and significant effects on lending in the context of Iranian households (Cude, Chatterjee, & Tavosi, 2020), the trait is insignificant in the cases of Mongolia (Ganbat, Batbaatar, Bazarragchaa, Ider, Gantumur, Dashkhorol, Altantsatsralt, Nemekh, Dashdondog, & Namsrai, 2021) and the United Kingdom (Gerhard et al., 2018; Harrison & Chudry, 2011). One potential reason is the different nature of credit arrangement in these countries, where, for example, in Iran, credit contract that is based on Islamic principle is very popular as an alternative to the usury-based options (Cude et al., 2020). Therefore, this study aims to fill the gap in the literature by investigating the impact of the Big Five personality traits on borrowing behavior in Indonesia. Indonesia is an important case due to its significant population of more than 278 million, placing the country as the fourth largest nation in the world and the largest in Southeast Asia with the highest number of inhabitants. In addition, there has been an increase in household debt ratio from 9.92% to 10.04% from 2011 to 2016 in the country (Noerhidajati, Purwoko, Werdaningtyas, Kamil, & Dartanto, 2021).

This study looks at two dimensions of borrowing behavior among households: whether they intend to borrow from various sources and the ratio of loan to annual income. Following Goldfayn and Vellenkoep (2018), we posit the Big Five personality traits as inputs in the intention to borrow and deciding how much to borrow. Since other personality factors act as substitutes

or complements to the Big Five personality traits and might impact borrowing behavior, this study also incorporates cognitive ability (Duckworth & Weir, 2011) and subjective financial well-being.

Using the 5th wave of Indonesia Family Life Survey (IFLS) data, which provides direct measures of the variables of interest, we find that openness to experience and extraversion are the most important elements of the Big Five personality traits that affect intention to borrow. However, none of these traits affect the loan to annual income ratio. In addition to the importance of the Big Five personality traits, the result also shows that cognitive ability has a positive relationship with the intention to borrow. The results of this study have several implications for policy makers and lenders.

The remaining parts of this article are structured with the second section discussing relevant theoretical backgrounds and clarifying the terms used in this study, particularly those related to the Big Five personality traits and their measurement. The third section explains in more detail the data and methodology used in this study, and the fourth section presents the results of this study and discusses the main findings as well as their implications. The last section concludes the overall discussions of this article and provides some suggestions for future research.

2. Literature Review

2.1. Behavioral Finance

Most mainstream classical economic theories were built based on the rational actors' assumption, where people are perceived as well-informed and can process all the necessary information in making decisions (Jappelli & Padula, 2013). However, studies on behavioral economics have proven that people often behave irrationally, and thus their decisions often lead to non-optimal outcomes (Ritter, 2003).

Following the behavioral theories, many studies have attempted to see the role of psychological factors on various economic outcomes. Dohmen, Falk, Huffman, and Sunde (2010) investigate the role of cognitive ability in decision making. Non-cognitive factors, or personality traits, have also been shown to be relevant in financial decision making. In economic models, personality traits are viewed as combinations of preferences, constraints, and information (Almlund, Duckworth, Heckman, & Kautz, 2011). Specifically, we can see research on investors' overconfidence (see for example: Barber & Odean, 2001), self-control (Gathergood, 2012), locus of control (Kesavayuth, Ko, & Zikos, 2018), motivation (Rha, Montalto, & Hanna, 2006), heuristics (Benartzi & Thaler, 2001), mental accounting (Barberis & Huang, 2001), risk tolerance (Campbell & Viceira, 2015; Shin & Hanna, 2015; and Wang & Hanna, 2007), and conservatism (Doukas & MacKnight, 2005).

2.2 Household Borrowing Decisions

Households make financial decisions ranging from payment choices, debt financing, saving vehicles, and insurance contracts in many instances during their lifetime (Guiso & Sodini, 2013). The breadth and importance of household finances, especially on the economy of a country, make this field an attractive field of research for academics. Household borrowing decisions are particularly interesting to discuss because household debt balances are largely increasing over the last decades. Households have relatively easy access to credit nowadays, which also contributed to the large increase in households' debt (Guiso & Sodini, 2013; Haughwout, Lee, Scally, Thomas, & van der Klaauw, 2019).

In general, there are several reasons for why households perform borrowing behavior, including to smooth out their consumption in the events of negative income shock, to finance large intentional or unintentional expenditures such as purchasing car or property, to pay for discretionary expenditure, to fund high-return investment, and to invest in human capital, among others (Guiso & Sodini, 2013). These reasons translate into a variety

of ways in which people can raise debt, which can be categorized into several types of debt, including mortgage debt, consumer debt, credit card debt, and education debt.

In the standard economic framework, the life-cycle hypothesis (Modigliani & Brumberg, 1954) is an early explanation of people's saving (and borrowing, that can be interpreted as negative savings) behavior. According to this theory, households are perceived as rational and will use saving and borrowing to smooth their consumption due to income variability over time. People will have lower consumption during periods of high income, compared to consumption during periods of no or low income (Lusardi & Mitchell, 2014). In reality, predicting future income is a complicated task, and as a result, in many cases, decisions made lead to sub-optimal outcomes. An alternative to the traditional life-cycle hypothesis is the behavioral life-cycle hypothesis (Shefrin & Thaler, 1988). This theory highlights the role of self-control, which affects preferences in saving decisions.

Further studies on financial decisions revealed that a borrowing decision, as other financial decisions entail, is an extremely complex decision which was often shaped not only by the institutional environment in which they were taken but also by personal characteristics of household members. Institutional environment is largely related to regulatory, cultural, and historical reasons which affected households' borrowing decisions (Guiso & Sodini, 2013). On the other hand, personal characteristics of customers might include cognitive (e.g., IQ) and non-cognitive (e.g., personality traits) capacities of an individual (Goldfayn & Vellekoop, 2018). For instance, many households appear to have poor understanding of financial instruments which, in turn, limits their cognitive capabilities in processing which type of debts they should have taken. However, non-cognitive capacities of an individual can be a substitute as well as a complement to improve that financial decision (or make matters worse, depending on the combination). An example of complement between cognitive and non-cognitive capabilities is that the

certain personality trait that heightened people's curiosity in trying a new investment product can be complemented by better financial knowledge to attain a better judgment on whether they should have invested. Other factors, such as consumer sentiment, also play a crucial role in determining a household's decision to borrow. However, in this study, we focus on the view that personality traits are significant inputs for the household's borrowing decision.

2.3 Big Five Personality Traits and Borrowing Behavior

The investigation of the taxonomy of personality traits goes way back to 1934 when Thurstone found that the sixty adjectives commonly used for describing people can be accounted for by five independent common factors (Goldberg, 1993). Since then, researchers in the field of personality psychology have been searching for a unified taxonomy that could systematically organize multiple facets of individual traits. Much evidence from earlier studies shows that all personality measures can be represented with five-factors, also called "Big Five" (Goldberg, 1990). These five-factors were further labeled as openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism. This model was initially disliked and became an object of criticisms. However, those criticisms were also said to be contributed to its success. Up to present day, the Big Five personality model has been acknowledged and very much used by researchers from various fields. It has been validated and translated into different languages, having been found to be generalizable across different cultures by different observers (Judge, Higgins, Thoresen, & Barrick, 1999).

Each personality dimension in the Big Five personality model encompasses a variety of related traits. Openness to experience has traditionally been labeled as culture, and this trait is also largely associated with intellectuality, curiosity, and creativity characteristics. Individuals with openness traits tend to like trying new things and supporting ideas rather than resisting to change (Goldfayn, 2016; Judge et al., 1999). Someone who

has a high level of conscientiousness is characterized as a dutiful, organized, achievement-oriented, and dependable person. This is related to the individual's level of self-discipline, persistence, and attention to details (Goldfayn, 2016; Judge et al., 1999). Extraversion is attributed to the characteristics of socially oriented individuals such as being outgoing and gregarious, dominant and ambitious, as well as assertive (Goldfayn, 2016; Judge et al., 1999). Due to those characteristics, extraverted individuals tend to exert reward-seeking behavior and conspicuousness making them more likely to become a leader. In contrast to extraverted individuals are introverted individuals who demonstrate characteristics such as silence, passivity, and reserve. Agreeableness is manifested in traits like caring, conflict-avoiding, and trusting. Individuals with an agreeableness nature are much more likely to conform to the situation as well as being likable. Neuroticism refers to the emotional stability of individuals, and characteristics such as calm and emotionally stable (positive) and anxious, nervous, and insecure (negative) are highly associated with the dimension.

There is apparent evidence that these five personality traits might influence households' financial decisions, including debt acquisition and financial assets accumulation (Brown & Taylor, 2014). It certainly seems possible because personality traits might lead to a decision made by individuals. For example, people who have high levels of curiosity might be willing to invest more in stocks since they tend to be risk-takers and like experiencing new things. However, previous studies have shown inconclusive results of which personality traits are most prevalent in explaining financial decisions (Brown & Taylor, 2014; Goldfayn, 2016). The results are more likely to depend on the context, such as the type of financial products and whether the decisions are taken by individuals or couples. Accordingly, we will further hypothesize and investigate the relationships between the Big Five personality traits and household borrowing decisions.

2.4 Hypotheses Development

Researchers have conducted studies to empirically examine the effect of personality traits on the financial behavior of households and individuals (Brown & Taylor, 2014; Goldfayn, 2016; Goldfayn & Vellekoop, 2018). The majority of the studies found that, to some extent, personality traits are related to financial behavior, including savings and investment decisions as well as borrowing behavior (Goldfayn, 2016; Goldfayn & Vellekoop, 2018). Personality traits can be substitutes as well as complements of an individual's cognitive abilities in producing human capital (Goldfayn, 2018). People who lack financial knowledge are still able to manage their finances well if they possess certain characteristics such as self-discipline, which is largely associated with conscientiousness traits (Nyhus & Webley, 2001). In this section, we build our hypothesis on the relationship between the Big Five personality traits and households' borrowing behavior based on previous works.

Openness to experience is largely associated with seeking new experiences. Those who have low scores on openness to experience are generally more conservative and narrow-minded. On the other hand, a high score on openness to experience can indicate a higher willingness to experiment and try new things, which may present as a cognitive stimulus to risk-taking behavior (Pinjisakikool, 2018), including borrowing. There is much evidence from previous research which supports a positive relationship between risk-taking behavior and openness to experience (Arthur & Graziano, 1996; Booth-Kewley & Vickers, 1994; Pinjisakikool, 2018). Moreover, this relationship between openness to experience and borrowing behavior is also supported by Brown and Taylor (2014), who found that openness to experience is strongly related to personal finances in terms of the levels of debt and assets held. Therefore, we hypothesize:

H1: Openness to experience is positively related to households' borrowing.

A previous study by Brown and Taylor (2014) found that, unlike other personality traits which were positively associated with unsecured debt, conscientiousness is inversely correlated with unsecured debt across all samples, individual and couples. This evidence is also supported by Goldfayn (2016) who demonstrated that conscientiousness and agreeableness are significant predictors of who holds the authority of households' financial decisions as well as predictors of stock ownership among older people. People with a high score of conscientiousness tend to be more disciplined, organized, and dutiful. Conscientiousness is also related to traits such as planning and self-control. People with high conscientiousness tend to be able to manage their money well because they have the ability to control their impulses and stick to their goals, making them more likely to have higher discretionary savings and less likely to borrow money (Donnelly et al., 2012; Goldfayn & Vellekoop, 2018; Harley & Wilhelm, 1992; Nyhus & Webley, 2001). As Webley and Nyhus (2001) reported, people who have had mild or serious debt at least once were less conscientious than people who have never had debt.

H2: Conscientiousness is negatively related to households' borrowing.

For single individuals, Brown and Taylor (2014) found that extraversion is the most prominent personality trait, compared to the other four elements of the Big Five personality traits, to be associated with the probability of holding unsecured debt. Extroverts are expected to borrow more than introverts because they are more likely to go out, meet people, and socialize, which influences their spending behavior and, in turn, gives them extra expenditures. It is plausible to expect that extroverts are more inclined to borrow to pay for their conspicuous consumption (Nyhus & Webley, 2001). Therefore, we hypothesize:

H3: Extraversion is positively related to households' borrowing.

People with a high score on agreeableness have a tendency to be easily persuaded to borrow money. This is because highly agreeable people

tend to perform behaviors such as gift-giving and spending on charity, and their opinion is not as strong since they prefer to avoid conflict with other people. Their concern with other people makes them more likely to spend their money and borrow than less agreeable people (Webley & Nyhus, 2001). Brown and Taylor (2014) even found that agreeableness is the personality trait which had the largest correlation with levels of unsecured debt among couples. Therefore, we hypothesize:

H4: Agreeableness is positively related to households' borrowing.

Lastly, neuroticism is associated with an individual's level of emotional stability. People with a high level of neuroticism tend to be on the neurotic side of the emotionally stability dimension. The literature is less conclusive on the relationship between neuroticism and borrowing behavior. On the one hand, emotional stability is related to elements such as planning and self-control, which implicates that emotionally stable people are more likely to follow their plans and refrain from impulsive and excessive buying (Nyhus & Webley, 2001). On the other hand, emotionally unstable people tend to be more impulsive and vulnerable. They are less likely to be able to control themselves which may lead to a variety of social and personal problems, including overspending, impulsive spending, and compulsive buying (Yahdanparast & Alhenawi, 2017). Consequently, people who score high on neuroticism are more likely to borrow. In contrast, empirical findings by Cude et al. (2020) show that neuroticism has a negative correlation with borrowing behavior, while Brown and Taylor (2014) show a statistically insignificant relationship between neuroticism and borrowing behavior. Therefore, we do not expect any specific sign in the case of neuroticism, and thus we hypothesize:

H5: Neuroticism is related to households' borrowing.

3. Data and Research Method

3.1 Data

In this study, we use the most recent (5th) wave of Indonesia Family Life Survey (IFLS) which was conducted in 2014. It is considered to be one of the largest and most comprehensive datasets of Indonesian households and individuals, and the characteristics of the sample are claimed to be representative of 83% of Indonesia's population. There are 13 provinces covered in IFLS, from the Western, Central, and Eastern parts of Indonesia. Several studies have also benefited from the use of IFLS (see for example: Fernandez, Della Giusta, & Kambhampati, 2015). Ethical clearance for this survey was approved by the Internal Review Board (IRB) at RAND's Human Subjects Protection Committee (RAND's IRB), number s0064-06-01-CR01.

The household questionnaire is divided into different sections. Some of the sections can be answered by several members of the households, while certain sections are at the household level, and thus should only be answered by the main breadwinner or primary caretaker of the households. This latest wave has an additional section on respondents' cognitive skills and non-cognitive traits, including the Big Five personality traits.

3.2 Measures

3.2.1. Borrowing behavior

There are some questions in IFLS that can be used to examine different aspects of borrowing behavior, but this study focuses on the following two: whether the households have attempted to borrow in the past year (Question *bh02*: *Did you or other members of the household try to borrow any money or goods from a source other than your family or friends over the past 12 months?*), which to some extent is similar to the measure used by Goldfayn and Vellekoop (2018); and the amount of debt the households held (Question *bh28*: *What are the total loans now?*). The latter is then normalized using the total annual income of the respondent. It should be noted that these two

indicators of borrowing behavior measure different aspects. Intention to borrow shows the desire or need to borrow and does not capture the ability to borrow, as the approval depends on the lenders. On the contrary, loan to annual income ratio shows both the intention and ability to borrow. The latter is partly attributed to the borrower's capacity.

3.2.2. Big Five personality traits

The 5th wave of IFLS includes the Big Five Index (BFI) 15, a relatively short version of the Big Five personality traits measure and a subset of BFI 44. This can be found in section *psn* of the survey. Similar questions have also been used in other living standard surveys, such as the German socio-economic panel.

There are three questions to measure each element of the Big Five personality traits. Table 1 presents the questions in further detail. Respondents can answer using a 5-point Likert scale, where 1 represents "*strongly disagree*" and 5 means "*strongly agree.*" We had to make some adjustments in certain questions, as these questions are reversed, i.e., a higher score indicates a lower attribute in the respective Big Five personality traits' elements. The responses to these questions are reversed (i.e., 1 becomes 5, 2 becomes 4, etc.). We then constructed a composite score using principal component analysis (PCA) for each trait to be used in the regression analyses.

Table 1. Description of the Big Five personality traits

Variables	Responses
Extraversion	
I see myself as someone who is talkative	1–5 (1 = Strongly
I see myself as someone who is reserved (reversed)	Disagree;
I see myself as someone who is outgoing, sociable	5 = Strongly Agree)
Conscientiousness	

I see myself as someone who does a thorough job	1–5 (1 = Strongly
I see myself as someone who tends to be lazy	Disagree;
I see myself as someone who does things efficiently	5 = Strongly Agree)
Openness to experience	
I see myself as someone who is original, comes up with new ideas	1–5 (1 = Strongly
I see myself as someone who has an active imagination	Disagree;
I see myself as someone who values artistic, aesthetic experiences	5 = Strongly Agree)
Neuroticisms	
I see myself as someone who is relaxed, handles stress well	1–5 (1 = Strongly
I see myself as someone who worries a lot	Disagree;
I see myself as someone who gets nervous easily	5 = Strongly Agree)
Agreeableness	
I see myself as someone who has a forgiving nature	1–5 (1 = Strongly
I see myself as someone who is considerate and kind to almost everyone	Disagree;
I see myself as someone who is sometimes rude to others	5 = Strongly Agree)

3.2.3. Cognitive ability

Similar to the study by Goldfayn (2018) and Cude et al. (2020), the aspect of cognitive ability measured in this study is numeracy, as this skill is important for financial decisions like borrowing (Table 2). There are two indicators of numeracy: serial seven and missing numbers. In serial seven, respondents were required to subtract 7 from five prior numbers, starting with 100. The score then ranges from 0 (no correct answer) to 5 (all answers are correct). For missing numbers, respondents had to fill in a blank of a series of numbers that follow certain patterns.

Table 2. Description of cognitive ability

Variables	Responses
Cognitive 1: Serial 7	
What are 100 minus 7 equal to?	
And - 7 from that?	1 = correct response;
And - 7 from that?	0 = otherwise
And - 7 from that?	
And - 7 from that?	
Cognitive 2: Missing numbers	
1 missing number of a series of 4 numbers	1 = correct response;
1 missing number of a series of 4 numbers	0 = otherwise
1 missing number of a series of 5 numbers	

3.2.4. Risk preference

One section in the 5th wave of IFLS consists of questions on choosing between a certain outcome and probabilistic outcomes. Specifically, respondents are asked gradually to choose between a series of two possibilities: 100% chance of receiving a certain amount of money versus 50% chance of receiving a larger amount of money and 50% chance of receiving a significantly smaller amount of money. We constructed a 1-5 scale measure to measure risk preference based on these questions, where a higher value reflects a higher risk preference as it shows a lower amount of expected probabilistic outcome that one would sacrifice to earn a certain outcome. For example, when respondents are asked to choose whether to earn a specific amount of IDR 800,000 or equal chance of either IDR 600,000 or IDR 1.6 million, we interpret the expected probability outcome as IDR 1.1 million (50% x IDR 600,000 + 50% x IDR 1.6 million). There are four questions used in this study, each with a different amount of money in the scenario, as can be seen in more detail in Table 3.

Table 3. Description of risk preference

Variable	Responses
Suppose you are offered two ways to earn some money. With option 1, you are guaranteed IDR 800,000 per month. With option 2, you have an equal chance of either the same income, IDR XXX per month, or, if you are lucky, IDR 1.6 million. per month, which is more. Which option will you choose?	1 = if the respondent prefers to earn a certain amount of IDR 800,000 rather than a 50% chance to earn IDR 800,000 or 50% chance to earn IDR 1.6 million 2 = if the respondent prefers to earn a certain amount of IDR 800,000 rather than a 50% chance to earn IDR 1.6 million or 50% chance to earn IDR 600,000 3 = if the respondent prefers a 50% chance to earn IDR 1.6 million or 50% chance to earn IDR 600,000 rather than to earn a certain amount of IDR 800,000 4 = if the respondent prefers a 50% chance to earn IDR 1.6 million or 50% chance to earn IDR 400,000 rather than to earn a certain amount of IDR 800,000 5 = if the respondent prefers a 50% chance to earn IDR 1.6 million or 50% chance to earn IDR 200,000 rather than to earn a certain amount of IDR 800,000

3.2.5. Subjective financial well-being

This variable is measured using item sw04 from the survey, which asked respondents to rate their standard of living, specifically: *Concerning your current standard of living, which of the following is true*? Respondents can choose among three options, where 1 means "*it is less than adequate for my needs,*" 2 represents "*it is just adequate for my needs,*" and 3 reflects "*it is more than adequate for my needs.*"

3.2.6. Socio-demographic factors

To control the effect of socio-demographic factors on borrowing behavior, we include 11 variables in the equation model: gender, age, education level, internet access, household wealth, ownership of land for farming, house ownership, household size, chronic illness in the family, children in the family (less than 18 years old), and experience of financial difficulties. The selection of these variables is based on prior studies on household financial behavior (see for example: Donnelly et al., 2012; Kesavayuth et al., 2018; Goldfayn & Vellekoop, 2018). Further details on the measurement of these variables can be found in Table 4.

Table 4. Description of socio-demographic variables

Variables	Responses
Gender	1 = Male; 0 = Female
Age: how old are you	Open question
Education: what is the highest education level attended	1 = Elementary school or lower 2 = Junior high school, senior high school, or similar levels 3 = University or above
Do you have internet access?	1 = Yes; 0 = No
Household wealth: What is the total value of [asset X] at present?	The total values of assets owned by the household
Do you have land for farming?	1 = Yes; 0 = No
What is the status of this house?	1 = Self-owned; 0 = Otherwise
Household size	Total number of household members
Chronic illness in the family: Have a doctor/paramedic/nurse/ midwife ever told you that you had [chronic illness x]	1 = There is at least one household member with chronic illness; 0 = Otherwise
Children in the family	1 = There is at least one household member who is less than 18 years-old; 0 = Otherwise
Experience of financial difficulties: In the last five years, if these households have experienced the things that cause economic disruption?	1 = Yes; 0 = Otherwise

3.3 Method

Two statistical models are used in this study to answer the research questions. In the first model, the dependent variable is the intention to borrow measured by a dummy variable, and the full model can be written as:

$$INT_i = \alpha + \beta_1 OPE_{ij} + \beta_2 CON_{ij} + \beta_3 EXT_{ij} + \beta_4 AGR_{ij} + \beta_5 NEU_{ij} + \beta_6 COG_{ij} + \beta_7 SFW_{ij} + \beta_8 RIS_{ij} + \beta_9 SOC_{ij} + \varepsilon_i \quad (1)$$

The second model uses the loan to annual income ratio as a measure of borrowing intensity and is represented by the following equation:

$$LTI_i = \alpha + \beta_1 OPE_{ij} + \beta_2 CON_{ij} + \beta_3 EXT_{ij} + \beta_4 AGR_{ij} + \beta_5 NEU_{ij} + \beta_6 COG_{ij} + \beta_7 SFW_{ij} + \beta_8 RIS_{ij} + \beta_9 SOC_{ij} + \varepsilon_i \quad (2)$$

where INT_i is measured by a dummy variable of household's intention to borrow; LTI_i is the loan to annual income ratio of the household; OPE_{ij}, CON_{ij}, EXT_{ij}, AGR_{ij}, and NEU_{ij} represent the composite scores of openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism of person j in household i, respectively; COG_{ij} is the measure of cognitive ability of person j in household i; SFW_{ij} is the subjective financial well-being of person j in household i; RIS_{ij} is the risk preference of person j in household i; and SOC_{ij} represents a set of socio-demographic factors that consist of gender, age, education level, internet access, household wealth, ownership of land for farming, house ownership, household size, chronic illness in the family, children in the family (less than 18 years old), and experience of financial difficulties. A probit estimation is used in the first model as the dependent variable is binary, while in the second model, we use ordinary least squares (OLS) with robust standard errors to correct for potential heteroskedasticity problems.

As can be seen from the model, variables used to measure borrowing behavior are available at the household level, while the personality factors are collected from each individual in the household who is older than 18 years old. Moreover, there is no information on the person responsible for

borrowing decisions in the household. One variable that can be best used as a proxy is the decision maker regarding savings. We address this by including only those individuals who participate in saving decisions, as borrowing can be perceived as negative saving.

4. Results and Discussions

4.1 Descriptive Statistics

We first present the summary statistics of our data. Among more than 31,000 respondents in IFLS 5, the total number of respondents who participate in saving decisions is 10,258. Table 5 shows that only slightly more than 33% of these respondents admitted that they and/or other members of the households tried to borrow money from external sources. This number can be compared to the result of Global Findex database, where 55% of Indonesians have borrowed from various sources in the past one year, including financial institutions, friends, families, and relatives (Demirgüç-Kunt et al., 2017). Around 58% of the saving decision makers are women, and the average age of the respondents is approximately 38 years old. In terms of other socio-demographic indicators, the proportions of respondents whose households have land for farming, live in self-owned houses, have family members with chronic illness, have children in the family, and experienced financial difficulties in the last five years are around 32%, 75%, 35%, 82%, and 83%, respectively. Meanwhile, slightly more than 33% of the respondents have access to the internet. The average value of household wealth is IDR 213 million (approximately USD 14,700), and the average number of household members is around four.

With regard to the amount of borrowing (loan to annual income ratio), overall, respondents borrow slightly more than two times their annual income. We identify a high dispersion in this variable, as there are cases where people borrow a very large amount of money. It can be noted that the number of observations for this variable is significantly lower than those of other

variables, as the number of respondents reporting their income is limited (less than 4,000). This leads to the smaller number of observations in the regressions involving loan to annual income as a measure of borrowing behavior.

The responses to questions measuring the Big Five personality traits (openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism) are measured by the 5-point Likert scale. We adjust the responses to certain questions to maintain the consistency that higher numbers reflect higher scores in each trait. Among the statements on openness to experience, responses to OPE3 show the highest mean. Meanwhile, among statements reflecting respondents' conscientiousness, CON1 has the highest mean, and the standard deviation of the responses to this question is also the lowest. For extraversion, the average score of responses to EXT3 is the highest, and similarly, the standard deviation is also the lowest. For agreeableness, the highest mean was recorded for AGR1, while for neuroticisms, NEU1 has the highest mean. Overall, neuroticism has the highest average score, and neuroticism is the most dispersed.

In this study, aspects of cognitive ability mainly measured respondents' mathematical skills, and they are summarized by two indicators: serial 7 and missing numbers. In general, the respondents performed better in missing numbers than serial 7, as the average score of the former is higher. Respondents' abilities in missing numbers tend to be less dispersed.

Overall, respondents also have positive subjective financial well-being, as the mean is higher than 2 (out of 3). Meanwhile, the average score of risk preference is higher than 2.5 (out of 5), indicating that there is a weak tendency toward risk-taking.

Table 5. Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Loan to annual income ratio	3,845	2.01	31.23	0.00	1,666.67
Openness to experience	10,197	0.08	1.14	-4.89	2.30
Conscientiousness	10,197	0.12	1.08	-5.24	2.30
Extraversion	10,197	0.05	1.13	-3.62	2.68
Agreeableness	10,197	0.02	1.15	-6.82	1.98
Neuroticism	10,197	0.05	1.13	-2.57	2.53
Cognitive 1: Serial 7	10,200	0.57	0.37	0.00	1.00
Cognitive 2: Missing numbers	10,190	0.61	0.28	0.00	1.00
Subjective financial well-being	10,252	2.12	0.64	1.00	3.00
Risk preference	10,224	2.74	1.51	1.00	5.00
Age	10,257	38.48	11.88	15.00	93.00
Education	9,980	1.92	0.67	1.00	3.00
Household wealth (IDR million)	10,184	212.84	334.17	0	3,946
Household size	10,198	4.29	1.69	1	18

Variables	Obs	% value = 0	% value = 1
Intention to borrow: Dummy borrowing	10,241	66.24	33.76
Gender: Dummy male	10,257	58.73	41.27
Internet access: Dummy internet access	10,257	66.93	33.07
Land ownership: Dummy land for farming	10,245	68.22	31.78
House ownership status: Dummy self-owned house	10,245	24.84	75.16
Chronic illness in the family: Dummy chronic illness in the family	10,198	65.16	34.84

Children in the family: Dummy children (<18 years old) in the family	10,198	17.84	82.16
Financial difficulties: Dummy financial difficulties	10,185	17.18	82.82

4.2. Regressions' Results

The results of the regressions are shown in Table 6. Since the focus of this study is on how the elements of the Big Five personality traits correlate with household borrowing behavior, we only include these factors as independent variables, with dummy variables of intention to borrow and loan to annual income ratios serving as the dependent variables. These can be seen in the second and fourth columns of Table 6. Afterwards, we include cognitive ability, subjective financial well-being, risk preference, and socio-demographic indicators in the models, and the results are presented in the third and fifth columns. The result of the Variance Inflation Factors (VIF) suggests no multicollinearity problems in the model.

Among the Big Five personality elements, only openness to experience and extraversion are significantly correlated with intention to borrow, both with positive coefficients. The significances of these variables are maintained even if the additional control variables are incorporated in the model, and there are no changes in the signs. Cognitive ability as measured by serial 7, risk preference, internet access, household size, and having family members with chronic illness increase the chance of having intention to borrow. Meanwhile, the higher the subjective financial well-being and the older the age of the decision maker, the lower the probability that the household will seek to borrow. Similarly, experience of financial difficulties within the last five years tends to decrease the probability of having intention to borrow.

On the other hand, the regressions' results, where the loan to annual income ratio serves as the dependent variable, reveal that none of the elements of the Big Five personality traits are statistically significant predictors. Moreover, all control variables have no significant associations with the loan to annual income ratio.

Table 6. Regressions' results

Variables	(1) Intention to borrow	(2) Intention to borrow	(3) Loan to annual income	(4) Loan to annual income
Openness to experience	0.0529***	0.0400***	-0.3620	-0.3434
	(0.0126)	(0.0132)	(0.3494)	(0.3284)
Conscientiousness	-0.0072	-0.0072	-0.5950	-0.5592
	(0.0134)	(0.0137)	(1.1093)	(1.0620)
Extraversion	0.0479***	0.0447***	0.5820	0.4823
	(0.0117)	(0.0121)	(0.4515)	(0.4925)
Agreeableness	0.0007	0.0058	0.3369	0.3317
	(0.0126)	(0.0130)	(0.2971)	(0.2735)
Neuroticism	-0.0102	-0.0004	-0.4031	-0.1664
	(0.0114)	(0.0121)	(0.4145)	(0.4494)
Cognitive 1: Serial 7		0.1190***		1.3018
		(0.0368)		(1.6080)
Cognitive 2: Missing numbers		0.0707		-1.2578
		(0.0523)		(0.9472)
Subjective financial well-being		-0.0818***		-0.7244
		(0.0215)		(1.2596)
Risk preference		0.0219**		0.3135
		(0.0088)		(0.2973)
Gender (male)		-0.0026		-0.3694
		(0.0285)		(1.3162)
Age		-0.0031**		-0.1320
		(0.0014)		(0.1248)

Education level		0.0206		0.4159
		(0.0390)		(0.4622)
Internet access		0.0696**		-1.7694
		(0.0343)		(1.4864)
Household wealth		-0.0000		0.0012
		(0.0000)		(0.0009)
Land ownership		-0.0226		1.9736
		(0.0295)		(2.0102)
House ownership		-0.0463		0.2792
		(0.0327)		(0.6270)
Household size		0.0186**		0.6163
		(0.0079)		(0.3847)
Illness in the family		0.0787***		1.3058
		(0.0285)		(1.8503)
Children in the family		-0.104		-4.6895
		(0.219)		(5.8507)
Financial difficulties		-0.2250***		-3.473
		(0.0343)		(2.5505)
Constant	-0.4260***	-0.2020**	2.2203***	7.7425
	(0.0130)	(0.0958)	(0.7008)	(5.6424)
Observations	10,181	9,878	3,820	3,766
Estimation method	Probit	Probit	OLS robust standard error	OLS robust standard error
Pseudo R-squared / R-squared	0.0034	0.0131	0.0011	0.0074
Prob. Chi2 / Prob. F	0.0000	0.0000	0.0207	0.1120

***, **, * denote significance at 1%, 5%, and 10%, respectively; standard errors are provided in parentheses.

4.3. Discussion and Implications

The result of this study suggests that personality factors do matter in intention to borrow but not in loan to annual income ratio, which measures both intention and ability to borrow. Among the Big Five personality traits,

openness to experience and extraversion are the most important, as these two variables affect intention to borrow. With regard to the former, the finding is in line with those from Brown and Taylor (2014) and Pinjisakilool (2018). People with high scores on openness to experience are less conservative and thus tend to be willing to try new things and take risks, including having debt.

The higher the level of extraversion of the person belonging to a household, the higher the chance that the respective household will try to look for loans from different sources. This confirms our a priori expectation and is in line with the study by Brown and Taylor (2014) and Nyhus and Webley (2001). The high importance of extraversion might also be explained by the fact that informal finance plays an important role in people's daily lives in Indonesia. Extroverts tend to socialize more, and they are probably less reluctant to borrow from relatives. In addition, they might also have wider social networks and thus more options for borrowing.

Neuroticism, on the other hand, has no significant relationship with either indicator of borrowing behavior. This is in line with Brown and Taylor (2014) and Ganbat et al. (2021), who found that this personality factor does not significantly correlate with debt. These contradict the findings of previous studies by Cude et al. (2020) in the Iranian context and Nyhus and Webley (2001), who suggest that neuroticism has a positive correlation with debt. Albeit insignificant, the coefficients' signs of conscientiousness and agreeableness are positive, and these are consistent with the findings of the previous literature (see for example: Brown & Taylor, 2014; Donnelly et al., 2012; Nyhus & Webley, 2001; Webley & Nyhuus, 2001).

This study has some policy implications for the Government of Indonesia. The national financial inclusion strategy that has been launched can incorporate the findings of this study. In addition, as the level of household debt has shown an increasing trend in the past year, and this might correspond to the national financial stability, policy makers might also consider the results of this study. The relevance of psychological factors in explaining people's

borrowing behavior means that financial decisions are not only affected by the levels of financial literacy and cognitive ability but also these non-cognitive traits. The efforts in nudging households' borrowing behavior should pay special attention to openness to experience and extraversion to be more effective. Indeed, it might be intuitive to see that people with low levels of these traits tend to be less eager to borrow, especially in Indonesia where borrowing from informal sources is relatively common. Therefore, financial inclusion efforts should also incorporate these traits, particularly when the aim is to encourage people to borrow from more formal sources. As studies have demonstrated that these typical efforts would be more effective if embedded in a school's curriculum, the government should also pay more attention to the non-cognitive aspects of traits, specifically openness to experience and extraversion.

For financial institutions, one consideration to decide whether a person or household should be given a loan or not is his or her debt capacity, as this usually directly links to the probability of default associated with excessive debt. However, the predictive power of the Big Five personalities on the amount of borrowing tends to be limited, and thus lenders should avoid relying too heavily on this information. It is known that incorporating psychological information to assess borrowers' creditworthiness is challenging, and in many cases, this is too burdensome for the potential borrowers. One key takeaway of this research is that if lenders believe that psychological characteristics should be parts of borrowers' assessments, they can focus more on openness to experience and extraversion. Marketing efforts should focus on leveraging the significances of these two traits.

5. Conclusion and Limitations

Behavioral economics questions the assumptions of rational actors in the mainstream economic theories, and thus empirical studies that investigate the impact of psychological factors on economic outcomes

emerged. This paper primarily aims to examine the relationships between the Big Five personality traits and borrowing behavior in the context of the Indonesian population, using a nation-wide survey that was conducted among more than 31,000 households. Two aspects of borrowing behavior are included in this study, i.e., intention to borrow and loan to annual income ratio.

The result shows that among the Big Five personality traits, openness to experience and extraversion are the most important determinants of borrowing behavior, as they are correlated with intention to borrow. However, it should be noted that none of the elements of the Big Five personality traits have significant association with loan to annual income ratio. This might be due to the fact that the two indicators measure different aspects of borrowing. While intention to borrow only indicates desire, loan to annual income ratio shows both desire and ability to borrow.

Nevertheless, this study has several inherent limitations that can be addressed by further research. First, as explained earlier, IFLS 5 does not provide information on borrowing decision makers, and thus we proxy this using savings decision makers, as borrowing can be perceived as negative savings. In reality, there might be differences due to the different risk preferences and knowledge. Second, although we control for cognitive ability that reflects respondents' numeracy, we do not include a specific measure of financial literacy, usually covering the knowledge and understanding of interest, inflation, and diversification concepts. While this has been shown to be relevant in predicting indebtedness (see for example: Chottewat-tanakul, Sharpe, & Chand, 2018), we do not include this because our data source, i.e., the IFLS, does not include such measures in the survey. Third, we could not distinguish the reasons for borrowing. Some borrowing might actually be necessary, while others borrowing are for consumptive purposes. Information on this is crucial to design appropriate policies to help people avoid unnecessary and excessive debt, which can be harmful to their long-term financial well-being. Fourth, borrowing from different sources is naturally

different and might be affected by different factors. The information from the *bh* module in IFLS 5 does not provide more details on the types of loans the respondents have, which becomes very important as alternative sources of borrowing such as peer-to-peer lending has recently become more popular (Johan, 2021). Having this information would actually provide more insights for lenders and policy makers. Fifth, the measure of intention to borrow in this study, as provided in the *bh* module of IFLS 5, also includes the intention to borrow from other family members. Having solely information on the individual's borrowing behavior might potentially lead to different results and thus different policy implications.

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