

The Importance of Numerical Abilities, Conscientiousness and Financial Literacy in
Financial Decision-Making: An Empirical Analysis in the Andean Region

María José Roa* Ignacio Garrón† Jonathan Barboza †

Abstract

The present study seeks to contribute to the debate about the factors that underlie and shape individuals' financial decisions. This issue is especially relevant considering individual, financial decisions have been shown to have a significant impact on individual and social welfare, poverty, inequality and economic growth. In particular, the objective of this study is to analyze the effects of cognitive characteristics, personality traits, and financial literacy on financial decision-making. Our analysis is based on the *Financial Capabilities Survey*, which was applied in the Andean Region. The empirical analysis shows: i) the importance of numerical abilities and conscientiousness in developing a propensity to save and borrow, and in participating in the formal financial sector; and ii) the relevance of financial literacy in promoting participation in formal financial markets, as well as in making more sophisticated financial decision-making. These results are relevant to the extent that they may allow financial institutions and governments to design financial education programs which promote financial inclusion and encourage people to make better financial decisions.

Keywords: financial development, cognition, conscientiousness, financial literacy, financial inclusion, savings, credit.

JEL: A20, D12, D14, G11, I20

* Corresponding Author: Senior Researcher, Center for Latin American Monetary Studies – CEMLA. Durango 54, Mexico City, 06700, Mexico. E-mail: roa@cemla.org, telephone +52 (55) 5061-6632.

† Center for Latin American Monetary Studies - CEMLA.

Introduction

Since its inception as a discipline, economic theory has sought to understand the main determinants that drive household financial decision-making. This topic is particularly important, given that these decisions have significant impacts on individual and social welfare, poverty, inequality and economic growth (Barro, 1991; De Long and Summers, 1991; Edwards, 1996; Levine, 2005; Deaton, 2010; Shay *et al.*, 2015). There exists theoretical literatureⁱ that takes into account the determinants of financial decision-making that are alternative or supplementary to those defined by neoclassical theory (Fisher, 1930; Modigliani and Brumberg, 1954; Friedman, 1957).

Firstly, several studies have shown the importance of taking into account cognitive characteristics when explaining socioeconomic behaviors. Cognitive characteristics, often thought of simply as intelligence, are related to abstract thought, and are commonly defined as the rate at which people learn, or the ability to apply reasoning in novel situations.ⁱⁱ These cognitive characteristics are typically measured by scores on intelligence tests, including IQ tests. The effect that cognitive characteristics have on a variety of economic and social outcomes is well understood and documented within the fields of economics, sociology, and psychology (Roberts *et al.*, 2007; Borghans *et al.*, 2008; Almlund *et al.*, 2011; Heckman and Kautz, 2012). Studies on the effects of cognitive skills on economic behavior have principally analyzed their impact on job performance (Schmidt and Hunter, 2004; Heckman *et al.*, 2006; Lee and Newhouse, 2013) and entrepreneurship (Zhao and Seibert, 2006; Ciavarella *et al.*, 2004; Klinger *et al.*, 2013a, b; Calderón *et al.*, 2015).

A recent and expanding body of work has also extensively documented the effect of cognitive abilities on financial behavior. This literature shows that higher levels of

cognitive abilities positively affect financial habits in different ways: fewer financial mistakes are made, there is less probability of default, a greater range of more sophisticated financial products are used, etc. (Cole and Shastry, 2009; McArdle *et al.*, 2009; Grinblatt *et al.*, 2012; Christelis *et al.*, 2010; Agarwal and Mazumder, 2013). These works primarily suggest that numerical abilities are strongly related to appropriate financial decision-making. Additionally, some studies have argued that cognitive characteristics could influence and determine intertemporal and risk preferences as well as different cognitive biases (Oechssler *et al.*, 2009; Burks *et al.*, 2009; Dohmen *et al.*, 2010).

More recently, some studies have analyzed the role of non-cognitive characteristics in socioeconomic behaviors. Non-cognitive characteristics are known in the literature by many other names, such as non-cognitive skills, personality traits, character skills, non-cognitive abilities, and character. Although the different names represent different properties, these terms are all used to describe personal attributes that are not measured by cognitive tests (Roberts, 2009). Psychologists have sketched a relatively commonly accepted taxonomy of personality traits known as the ‘Big Five’: Openness to Experience, Conscientiousness, Extraversion, Agreeableness and Neuroticism. Other taxonomies have been empirically and conceptually related to the Big Five (Almlund *et al.*, 2011; Borghans *et al.*, 2008).

Heckman and Kautz (2013), Borghans *et al.* (2011), and Almlund *et al.* (2011) reviewed recent evidence which indicates that cognitive characteristics and personality traits can be used to predict a series of social and economic outcomes. Their main conclusions are that non-cognitive characteristics could be as useful as cognitive characteristics (if not more useful) in predicting socioeconomic behaviors, and that they are more malleable than cognitive characteristics over the life cycle.

As of now, only a few studies have sought to explain households' financial decision-making in reference to individual personality traits. Some of these suggest that the presence of certain sub-facets related to Conscientiousness – in particular, propensity for planning and self-esteem – can explain financial distress (McCarthy, 2011), indebtedness and default frequency (Klinger *et al.*, 2013 a, b; Di Giannatale *et al.*, 2015), good management of finances (Kaufmann, 2012), investment biases (Jamshidinavid *et al.*, 2012), and savings (Kausel *et al.*, 2016).

Some of these papers also discuss an important question that has not yet been resolved completely, namely, the relationship between character skills and preference parameters used by economists. Most studies conclude that both conventional psychological traits and economic preference parameters may represent different skills that could be derived from a deeper set of motivation-oriented parameters (Almlund *et al.*, 2011; Becker *et al.*, 2012; Heckman and Kautz, 2013).

Financial literacy is another element that has recently been considered a relevant determinant of financial decisions. Financial literacy designates “peoples’ ability to process economic information and make informed decisions about financial planning, wealth accumulation, debt, and pensions” (Lusardi and Mitchell, 2014). In an increasingly complex financial world, and one in which individuals are becoming more accountable for their financial decisions, it has been shown that worldwide financial literacy levels are low, especially among the most vulnerable. Some studies that have evaluated the effects of financial literacy showed the existence of a positive correlation between financial literacy and appropriate financial decision-making (Lusardi and Mitchell, 2014); others have found no relevant correlation.

Some authors suggest that this difference in perspectives could stem from two factors. On the one hand, cognitive characteristics and education seem to be strongly related to financial literacy, so when it comes to measuring the impact of financial literacy it is necessary to control for these variables (McArdle *et al.*, 2009). On the other hand, there seems to be a problem of endogeneity between financial literacy and financial decision-making (Klapper *et al.*, 2012; Van Rooij *et al.*, 2011; Lusardi and Mitchell, 2014).

In recent years, some studies have tried to account for this potential endogeneity of financial literacy by implementing instrumental variables estimation to assess the impact of financial literacy on financial behavior (Klapper *et al.*, 2012; Lusardi and Mitchell, 2009; Behrman *et al.*, 2012; Van Rooij *et al.*, 2011; Bucher-Koenen and Lusardi, 2011). These works found financial literacy has a positive and significant effect on financial decision-making. This effect is greater than that found in the studies that do not take into account the potential endogeneity problem (Lusardi and Mitchell, 2014). Nevertheless, all of the authors cited stated that more research on this issue is needed.

Building on the above discussion, the objective of this study is to analyze the possible relationships between cognitive characteristics, personality traits, financial literacy, and preferences, as well as the possible effects of these variables on financial decision-making. If we fail to take into account these possible relations or links, our evaluation of the effect of these variables on financial decision-making will be biased. As far as we know, this analysis of the different determinants and their potential relationships and effects has not been carried out yet.

We based our analysis on the *Financial Capabilities Survey* applied in four countries of the Andean region: Bolivia, Colombia, Ecuador, and Peru. The project was coordinated by CAF, the Development Bank of Latin America (Mejía and Rodríguez, 2016). Based on the

results of the survey, we elaborated indicators of financial literacy, cognitive characteristics and personality traits. Financial Literacy is measured with an indicator called PRIDIT, which weighs each question according to both its difficulty relative to the sample and how informative it is. Cognitive characteristics are measured in terms of numerical abilities. For the third indicator, personality traits, we measured three different sub-facets of Conscientiousness: propensity to plan or establish long-term goals, perseverance, and scrupulosity.

It should be noted that these results are relevant to the extent that they may allow financial institutions and governments to design financial education programs which promote financial inclusion, encourage people to make better financial decisions, and which segment the population according to criteria that go beyond sociodemographic variables.

This paper is organized as follows. Firstly, we present our unit of analysis and empirical methodology. Secondly, we present and discuss the descriptive statistics. Thirdly, we present the theoretical model and the results of the econometric analysis. Fourthly, we present the results of the instrumental variable analysis with which we overcame the endogeneity problem of financial literacy. Finally we lay out our argument and its principal conclusions.

1. Unit of Analysis and Methodology

Our study was based on the *Financial Capabilities Survey* (FCS) applied in Bolivia, Colombia, Ecuador and Peru (Mejía and Rodríguez, 2016). The FCS was coordinated by CAF; the survey was applied face-to-face and designed to be representative at a national level, following the recommendations and measurements used by the OECD (Atkinson and

Messy, 2012). The surveys included a total of 33 questions covering financial behaviors, knowledge, and attitudes, as well as the use of credit and savings products and sociodemographic information. This last segment of information is shown in Table 1.

<Insert here Table 1>

We used the FCS to develop indicators that allowed us to measure the main focuses of our study: personality traits, cognitive characteristics, intertemporal and risk preferences, financial literacy, and sociodemographic variables. We discuss in detail below the construction of each indicator.

In order to make our financial literacy indicator comparable to those used in related literature (Lusardi and Mitchell, 2008, 2011a, 2011b), we based it on a group of four standard questions. These questions are related to the calculation of interest rates or numerical ability, and to the concepts of compound interest, diversification of risk, and inflation. When these four questions were asked in Peru, Bolivia, Colombia and Ecuador, it was shown that the populations of those countries generally displayed a low understanding of financial literacy – less than a third of the population was able to answer three of the four questions correctly (see Table 2).

<Insert here Table 2>

On average, individuals respond relatively knowledgeably to questions on inflation and risk diversification. This result contrasts with studies in developed economies, where the questions related to interest rates and compound interest elicited the highest proportion of correct answers, while those related to risk diversification and inflation elicited the lowest. Our hypothesis is that this is due to the economic and financial experiences of people in the countries of our study, such as inflation episodes ('80-'90s) and economic crises. This result could also be due to the fact that, in reality, the interest rate question

measures numerical abilities: it is the only one that explicitly requires a calculation. For that reason, following other relevant studies (Van Rooij *et al.*, 2011; Gerardi *et al.*, 2013), we consider it to be a measure of cognitive abilities.

Following recent literature on financial literacy, we built a more sophisticated two-step weighting indicator of financial literacy, called PRIDIT (Behrman *et al.*, 2012). In the first step, each question is weighted by difficulty, applying a greater penalty for incorrectly answering a question that most of the population answered correctly, but greater credit for correctly answering questions that most of the respondents answered correctly. The second step applies principal components analysis to take into account correlations across questions in an attempt to measure how informative each question is. The resulting PRIDIT takes into account the fact that questions are more informative, *ceteris paribus*, the less their answers are correlated with other questions. But this is not the only criterion. Questions also tend to be more important on average, *ceteris paribus*, if the proportion of those that answered correctly is closer to one half than zero or one. The final PRIDIT weights indicate how “informative” any given question is (relative to the other questions) in relation to the underlying financial literacy variable. In order to elaborate the PRIDIT, we take into account six questions from the FCS that are designed to measure financial knowledge (Table 3). According to the PRIDIT criterion, questions 5 and 6 are the most important (final column in Table 3).

<Insert here Table 3>

The FCS contains several questions related to traits associated with one of the Big Five: Conscientiousness (see Table 4). We built on this by elaborating indicators of the following sub-facets: i) propensity to plan or establish long-term goals; (ii) perseverance; and (iii) scrupulosity (Heckman and Kautz, 2013).

<Insert here Table 4>

The indicator is a weighted average of these questions. To confirm that each question measured a different sub-facet of conscientiousness, following Klapper *et al.* (2012) and Garber and Koyama (2016), we carried out a principal components analysis.ⁱⁱⁱ We did not find a strong correlation among the questions and were thus able to assume that each one represented a different sub-facet. The indicator is a continuous variable with a maximum score of 1 (extremely diligent), and minimum score of 0 (not diligent at all). The distribution of the indicator is quite similar for each of the four countries (Figure 1).

<Insert here Figure 1>

Concerning risk and time preferences, we defined two binary variables, based on questions from the survey (Table 5) that reflect these preferences. As Di Giannatale *et al.* (2015) underscore, more complex questions are needed to measure preferences; overly simplistic questions featured in the survey may give rise to measurement errors.

Finally, we elaborated five dichotomous variables related to savings and credit decisions (through formal and/or informal mechanisms), which were the endogenous variables of our econometric analysis:

- V1. Holding formal saving products. If answered affirmatively (at least one product) codify as 1, if not then codify as 0.
- V2. Saved in the last year (formal or informal mechanisms). If answered affirmatively codify as 1, if not then codify as 0.
- V3. Saved in the last year (at least one formal mechanism). If answered affirmatively codify as 1, if not then codify as 0.

- V4. Saved in the last year (only informal mechanisms). If answered affirmatively codify as 1, if not then codify as 0.
- V5. Holding formal credit products. If answered affirmatively (at least one product) codify as 1, if not then codify as 0.

In Table 6, we present these financial decision variables by country. Across all four countries, 44.8% of the total population has at least one formal saving product. In Ecuador, this percentage is extremely high at 67.2%. Across all four countries, more than 59% of the population saved in the last twelve months, and used either formal or informal mechanisms to do so; this percentage is especially high in Bolivia where, as in Peru, formal and informal mechanisms are almost equally prominent. Interestingly, only 24.2% hold credit products, which is less than the percentage that holds savings products.

<Insert here Table 6>

2. Descriptive Statistics

To establish relationships among financial decision-making, financial literacy, socioeconomic characteristics, personality traits, cognition, and country level preferences, in this section we perform a disaggregated analysis of the data. As a first approximation to the possible link between financial decision-making and the rest of the variables, we outline some patterns that may be discerned in the data.

Firstly, Table 7 shows the 25th, 50th, and 75th percentiles of the conscientiousness index, broken down into percentages for the group of variables (V1-V5). The percentiles show that the distribution is symmetric across groups. As other studies have shown, we find that individuals who saved or used formal savings or credit instruments have significantly higher levels of conscientiousness than those who did not (Klinger *et al.*, 2013a,b;

McCarthy, 2011; Kaufmann, 2012; Jamshidinavid *et al.*, 2012; Di Giannatale *et al.*, 2015; Kausel *et al.*, 2016). The differences were 0.06, 0.06, 0.07, 0.01 and 0.06 points for the variables (V1), (V2), (V3), (V4) and (V5), respectively. The mean difference test confirms that these differences are significant for all the financial decisions.

<Insert here Table 7>

In Table 8, we present the affirmative responses to questions related to financial decision-making (holding any formal saving instrument, saving with formal or informal instruments, saving with at least one formal instrument, saving only with informal instruments, and holding any formal credit product) disaggregated by financial literacy, cognition (numerical skills), preferences, and socioeconomic characteristics. In line with the literature, individuals with higher levels of numerical skills tend to save and participate more in the formal financial sector, through both credit and savings. Nevertheless, it is striking that in the case of informal savings, no significant differences are observed when individuals are financially literate or have numerical skills. We believe this may be due to recurrent episodes of economic crises in these countries. The crises have fostered distrust of the formal sector, contributing to the rise of a system with harmonious coexistence between informal and formal instruments for saving and borrowing. Regarding time preferences and risk and their relationship with financial decision-making, individuals who are more risk averse and/or orientated towards the long-run, answered more of these questions affirmatively than those who are not.

<Insert here Table 8>

In relative terms, we observe that financially literate individuals with a higher educational level and higher, more stable incomes, as well as more stable employment statuses, tend to save and participate more in the formal financial sector.

Finally, regarding the age variable, we note that, while for savings there is no definite pattern, age follows an inverted U-shape for credit. This result is in line with life cycle models, according to which adults tend to become indebted while young or elderly people do not.

3. Econometric Analysis

3.1. Model

Our analysis is based on the Roy model of comparative advantage (1951). This model was initially used in economics by Heckman *et al.* (2006) to introduce personality traits into the study of labor market outcomes and social behavior. We extend the model to explain the five financial decisions discussed in the previous section. We denote with c_j , the choice of the individual, to decision j , where $j = V1, V2, V3, V4, V5$.

Let I_{c_j} be the net benefit associated with the individual's choice of financial decision j , represented by the following linear model:

$$I_{c_j} = \mathbf{X}'_c \boldsymbol{\beta}_{c_j} + \alpha_{c_j}^C f^c + \alpha_{c_j}^N f^N + \alpha_{c_j}^P f^P e_{c_j}, \quad j \in \{V1, V2, V3, V4, V5\}, \quad (1)$$

where \mathbf{X}'_c is a vector of socio-demographic observed variables affecting financial decisions, $\boldsymbol{\beta}_{c_j}$ is its associated vector of parameters, f^c is the level of cognitive abilities, f^N is the level of personality traits or non-cognitive characteristics, f^P represents the individual's time and risk preferences, $\alpha_{c_j}^C$, $\alpha_{c_j}^N$ and $\alpha_{c_j}^P$ are the parameters associated with cognitive characteristics, personality traits, and time and risk preferences, respectively, and e_{c_j} represents an idiosyncratic component assumed to be independent of \mathbf{X}'_c , f^c , f^N and f^P . It is assumed that time and risk preferences, cognitive abilities and personality traits are independent.

An individual chooses c_j that maximize:

$$D_{c_j} = \arg \max \{I_{c_j}\}_{j \in \{V1, V2, V3, V4, V5\}} \quad (2)$$

where D_{c_j} denotes the individual's choice of financial decision j . Equations (1) and (2) produce a standard discrete choice model with a factor structure (Heckman, 1981).

Cunha *et al.*, (2010) and Cunha and Heckman (2008) specified more robust economic models in which the factors are nonlinear and non-separable. Nevertheless, the assumptions of linearity and separability in the parameters simplify the analysis. Therefore, following Heckman *et al.* (2006) we interpret f^P , f^N and f^c as approximations to the basic parameters of preferences, personality traits, and cognitive characteristics that generate financial behavior. In doing so, we assume, following most literature on personality traits and cognitive characteristics, that these concepts are complementary when explaining their impact on financial behavior (Almlund *et al.* 2011; Becker *et al.* 2012; Rustichini *et al.* 2012).

3.2. Results

To identify the potential influence of personality traits, cognition, and financial literacy on financial decision-making, we first estimate a linear probability model by OLS,^{iv} based on the functional form derived from the Roy model. Our model has the following expression:

$$y_{i,j} = \beta_{0,j} + \beta_{1,j}cog_i + \beta_{2,j}con_i + \beta_{3,j}fl_i + \mathbf{X}'_i\boldsymbol{\theta}_j + u_{i,j} \quad (3)$$

where $y_{i,j}$ represents a binary variable of the j financial decision— $j \in \{V1, V2, V3, V4, V5\}$ —made by the i respondent, cog_i is a binary variable of cognitive skills (or numeracy skills), con_i is an indicator of conscientiousness, fl_i is an indicator of

financial literacy (alternatively, the binary variable of correct answers or the PRIDIT indicator), and X'_i is a vector of controls that includes: gender, age, educational level, marital status, income group, unemployment, income stability, and country-specific dummies; u_i is the stochastic residual which captures omitted variables and follows a binomial distribution.

Table 9 reports estimated coefficients for the linear probabilistic model^v of the decision to hold at least one formal savings product. The first column of the table reflects the estimates without the vector of controls X'_i . In this case, financial literacy – measured as the dummy equal to one if the respondent correctly answered at least two of three financial literacy questions (Lusardi and Mitchell, 2014) – cognition, and conscientiousness were significant. This means that a higher value of each of these variables increases the likelihood that an individual will hold at least one formal saving instrument. The same result is achieved if financial literacy is measured using the PRIDIT indicator (third column). Nevertheless, the measures of financial literacy become insignificant when introducing control variables in both models (columns 2 and 4).

<Insert here Table 9>

Regarding socio-demographic variables (columns 2 and 4), being a man, being employed, having a high and stable income, having a higher educational level, and living in Bolivia, Colombia or Ecuador, increases the probability of holding at least one formal savings product. Meanwhile, being single, a woman, or unemployed reduces this probability. Column 5 includes all the controls and excludes the financial literacy indicator. The explanatory ability of the model, measured by its R-squared, remains unaltered, along with the significance of its explanatory variables.

It should be noted that neither time nor risk preferences were significant in any of our regressions. As discussed above, we are justified in positing a relationship between cognition and preferences, with the direction of causality going from the former to the latter. This possible relationship would potentially eliminate or diminish the significance of preferences in our econometric exercise. However, in light of the possible measurement biases for the questions that measure those preferences, we believe this is not the case.

Table 10 provides coefficient estimates for the linear probability models regarding the usage of any saving mechanism (formal and/or informal) during the twelve months prior to the survey. The results are similar to the previous regressions, but with two important exceptions. The first: both including and excluding controls, financial literacy, measured by the binary indicator, is not significant. However when it is measured as the PRIDIT indicator it is significant, but with a sign that is the opposite of that which is expected. The second: gender is no longer significant, but age becomes significant at certain levels. In other words, the older the individual, the higher their likelihood of having saved.

<Insert here Table 10>

Table 11 shows the regressions related to the exclusive use of formal savings products during the previous twelve months as the dependent variable. As with the previous models, both conscientiousness and cognition are positively and significantly related to the probability of saving in this way, whereas financial literacy is insignificant. Furthermore, similar for our first dependent variable (holding at least one formal saving instrument) gender is significant, but age is not.

<Insert here Table 11>

Table 12, meanwhile, shows the regressions related to the exclusive use of informal saving mechanisms during the previous twelve months, as the dependent variable. Notably, conscientiousness is positively and significantly related to saving in this way, but numerical skills (cognition) are not. Financial literacy by contrast is significant (and its coefficient has the expected sign) only if it is measured as the PRIDIT indicator, both including and excluding controls. In line with the literature, we observed that being a woman and reaching a higher educational level increase the probability an individual saves informally. Also noteworthy is the fact that having a stable income is positively related to saving informally. Finally, it's worth noting that the informal sector is larger in Bolivia and Ecuador than in Peru.

<Insert here Table 12>

Table 13 reports the estimated coefficient for the decision to hold a formal credit instrument. Again, we observed that cognition and personality traits are significant, both with and without controls, whereas financial literacy, measured as the binary indicator, is still significant even when including controls. It becomes insignificant, however, when it is measured with the PRIDIT indicator and when controls are included.

<Insert here Table 13>

Regarding control variables, both specifications including controls show that if an individual is a man and has a higher, more stable income along with a higher educational level, his likelihood of having borrowed through formal instruments increases. Also of note is that age has a positive and significant coefficient at certain levels, and a negative and significant coefficient for its squared term, which is in line with the life cycle and permanent income theories.

From this analysis, we conclude that financial literacy plays a minor role, or no role at all, in whether an individual has held formal savings products or saved during the previous twelve months. It does, however, have a significant effect on saving informally and borrowing through formal instruments. In line with the literature, these results might be taken to suggest that the influence of financial literacy tends to be greater when it is associated with more complex financial decisions requiring more information (related to credits or securities, for example) than with simpler financial decisions (such as those related to savings accounts or bonds) (Van Rooij *et al.*, 2011; Christelis *et al.*, 2010).

Yet it is important to remember that the insignificance of financial literacy coefficients might be related to the presence of endogeneity. The endogeneity problem may be larger with savings decisions than with borrowing decisions, to the extent to which the savings instruments included in the survey are short-term ones, while the borrowing instruments included are more orientated towards the medium and long-term. Short-term savings instruments tend to allow a financial learning-by-doing process, which explains the presence of endogeneity for financial literacy.

An alternative explanation for this insignificance may be the existence of a strong relationship between financial literacy, education, and cognitive abilities (Delavande *et al.*, 2008; McArdle *et al.*, 2009; Lusardi and Mitchell, 2014). If this is the case, education and cognition may be reflecting the effect of financial literacy, and introducing the latter might imply over-controlling the estimation (McArdle *et al.*, 2009; Gerardi *et al.*, 2013).

4. Econometric Analysis: Instrumental Variables

In order to tackle the endogeneity issue head on, we followed an instrumented feasible generalized method of moments (IV-GMM), which is based on a two-step estimation (Baum *et al.*, 2007). The first step consists in estimating the potential, endogenous

regressor – in this case the financial literacy index (fl_i) – as a function of the set of controls used for the financial decision variables in (3), adding a set of instruments:

$$fl_i = \varphi_0 + \varphi_1 cog_i + \varphi_2 con_i + \mathbf{X}'_i \boldsymbol{\gamma} + \mathbf{Z}'_i \boldsymbol{\theta} + v_i \quad (4)$$

where \mathbf{Z}'_i is a vector of instruments and v_i is random noise that follows a normal distribution. In the case that *i*) \mathbf{Z}'_i is correlated with the financial literacy index, $Cov(fl_i, \mathbf{Z}'_i) \neq 0$, and *ii*) independent of $y_{i,j}$, then the orthogonality condition is satisfied, $Cov(u_{i,j}, \mathbf{Z}'_i) = 0$. Errors from equation (3) and (4) would thus not be correlated with each other, $Cov(u_{i,j}, v_i) = 0$, and we may consider the set of included instruments as valid for the financial literacy index.

In the second stage, to identify the potential effect of the financial literacy index (fl_i) on the financial decision variables ($y_{i,j}$), the (fl_i) is substituted in equation (3) by its first stage predicted value (\hat{fl}_i):

$$y_{i,j} = \pi_{0,j} + \pi_{1,j} cog_i + \pi_{2,j} con_i + \pi_{3,j} \hat{fl}_i + \mathbf{X}'_i \boldsymbol{\tau}_j + \omega_{i,j} \quad (5)$$

If the validity of the instruments is verified according to the above conditions, the estimators obtained by the second stage will be consistent.

To test the validity of the set of instruments considered, we performed a series of statistical tests to determine whether the conditions *i*) and *ii*) were satisfied. First, we use three tests to see if the instruments were robust in the first stage: the F test of excluded instruments; the Kleibergen-Paap LM weak identification test; and the Kleibergen-Paap F weak instruments test with Stock and Yogo (2005) critical values. Second, to verify that the instruments are independent of the error term in the second stage we used the Hansen-J overidentification test.

Regarding the instruments: as generally happens, we could not *a priori* identify appropriate instruments from our data. We therefore started with a set of candidates that could be used to predict financial literacy but would not be related to the endogenous variables under study. Taking into account the literature that has addressed the problem of endogeneity with several instruments (Lusardi and Mitchell, 2014), we took ‘number of universities by region’ as an instrument. With this instrument we tried to account for exposure to financial information or to peers/colleagues with higher financial knowledge (Klapper *et al.*, 2012). Following the same line of thought, the following questions of the FCS, related to an individual’s exposure to sophisticated financial information, were included as instruments: *i*) if the individual is aware of the concept of Deposit Insurance Funds; *ii*) if the individual has heard about mutual funds or investments in the stock markets; and *iii*) if the individual has heard about any insurance products at all. In the countries under consideration, the majority of the population is simply not aware of these concepts.

As an additional instrument, and following Reinhart and Rogoff (2009), we considered the number of financial crises that individuals had experienced in their lifetime. We used this instrument because, contrary to what happens in developed countries, questions related to the concepts of inflation and risk diversification had the fewest number of wrong or ‘do not know’ answers. This led us to think that individuals’ experiences of past financial crises in these countries may have caused them to acquire these economic concepts. Finally, we included the risk preference variable, since it was not significant in explaining financial decision-making.^{vi}

For the estimation we followed the GMM-IV approach, by taking the PRIDIT as a proxy indicator of financial literacy, because its continuous nature makes for easy handling

and interpretation of the results. At the same time, we took into account the specific survey design of each country in the estimation.^{vii}

The results of the first stage GMM-IV model are presented in Table 14. Similar to the financial decision regressions (Tables 9-13), many of the control variables included in equation (1), such as cognition, conscientiousness, schooling, and income stability, are significant, which could imply the possible existence of the endogeneity problem link to the financial literacy variable. In addition, the six candidates for instruments turned out to be individually significant and in conjunction proved to be good instruments for predicting financial literacy. First, the F test of excluded instruments equals 9.11 (p-value = 0.0000). Second, the chi-squared statistic of the Kleibergen-Paap under-identification test is equal to 32.10 (p value = 0.0000), rejecting the null hypothesis that the model is under-identified. Finally, the F statistic derived from the Kleibergen-Paap weak instruments test is equal to 9.11, indicating a maximum relative bias estimation of instrumental variables between 10% and 20% with respect to the estimation by OLS, according to the critical values tabulated by Stock and Yogo (2005).

<Insert here Table 14>

The results of the second stage are presented in Table 15. In this stage we verified that the instruments are independent of the error term through the Hansen J over-identification test. The results indicate that the instruments used are independent of the error term of the second stage in estimates of dependent variables V2 (saved in the last 12 months), V3 (saved formally in the last 12 months), V4 (saved only informally in the last 12 months), and V5 (hold credit instruments).

The results of the GMM-IV estimations show that the coefficient of the conscientiousness variable remains positive and significant for the estimation of the five

dependent variables considered (V1-V5). Meanwhile, the coefficients for cognition are positive and significant, except for the cases in which individuals saved only through formal or informal mechanisms (Table 15).

<Insert here Table 15>

On the other hand, the coefficient of financial literacy is negatively significant for the regression of informal savings (V2) and positively significant for the holding of formal credit products. These results are interpreted as follows: a) having a higher level of financial literacy decreases the likelihood an individual uses only informal savings mechanisms, which helps overcome barriers of financial self-exclusion (Roa, 2013); b) having a higher level of financial literacy increases the likelihood that an individual will hold formal credit instruments, a decision primarily orientated towards the medium and long-term.

Another noteworthy aspect of the results in the second stage of the GMM-VI model is that the magnitudes of the coefficients of financial literacy, with regard to saving only informally and to holding formal credit instruments, are greater than those obtained by their respective linear probability models. In fact, these results turned out to be consistent with the empirical evidence (Lusardi and Mitchell, 2014).

As for the rest of the socio-demographic controls included in the estimations, most of them generally had the same coefficient patterns as in the OLS regressions, both in terms of their significance and their signs.

5. Conclusions

The objective of this study has been to empirically analyze the possible effects of determinants of financial decision-making that are distinct to those posited by neoclassical theory. Specifically, we analyzed the effect of cognitive characteristics, personality traits,

and financial literacy on savings and credit decisions. To do so, we based our empirical analysis on the *Financial Capabilities Survey* applied in four countries of the Andean region: Bolivia, Colombia, Ecuador and Peru.

The results derived from the estimation of a linear probability model show that the presence of numerical abilities and personality traits related to conscientiousness – propensity to plan, perseverance, and scrupulosity – increase the probability that an individual will both save and hold formal credit and savings products. Higher levels of income and education have a similar impact on savings and credit decisions.

Our results also suggest that women and people with lower educational levels are more likely to participate in informal financial markets. It should be noted that, while a propensity to save through informal mechanisms positively depends on conscientiousness and income, it is not related to cognition. As has been shown in other surveys (Global Findex, Demirguc-Kunt *et al.*, 2015), this result might be linked to the fact that in the surveyed countries, formal and informal savings mechanisms coexist harmoniously across all socioeconomic levels.

The linear probability analysis revealed a problem of endogeneity between financial decisions and financial literacy. In order to study this problem rigorously, we adopted the generalized method of moments using instrumental variables. Instrumental analysis showed that financial literacy is negatively significant for informal saving, which suggests that a higher level of financial literacy decreases the probability that an individual will exclusively use short-term, informal savings mechanisms. Additionally, financial literacy is positively significant for holding formal credit products. In line with the literature discussed in this paper, financial literacy is important in the case of more complex financial products – such as investment funds or medium and long-term credit products – but not for simpler

products such as deposit or bond products. We highlight that, contrary to certain perspectives, financial literacy remains a relevant factor even after controlling for education and cognitive abilities.

The importance of conscientiousness and sociodemographic variables in savings and credit decisions was not diminished when we applied instrumental variable analysis. Moreover, cognition continued to be significant for savings decisions in the last twelve months and the holding of formal credit products.

In sum: firstly, we conclude that financial literacy is important for promoting participation in formal financial markets and for making more complex financial decisions. Secondly, in line with literature on cognitive characteristics, we conclude that numerical skills are strongly related to appropriate financial decisions. Finally, we conclude that factors associated with personality traits, specifically with different sub-facets of conscientiousness, appear to be a fundamental aspect of financial behavior.

It should be noted that the results of our study are relevant to the extent that they may allow financial institutions and governments to design interventions that segment the population according to criteria that go beyond sociodemographic variables (Lusardi and Mitchell, 2014). In particular, the use of empirical methodologies that measure personality traits and cognition could serve to identify individuals who are more likely to not keep up with their payments, to not save, or to not participate in the formal financial sector. Specific interventions should be designed for those individuals based on their cognitive and personality traits. An example of this is the design of products based on planning, or reminders for individuals with low levels of conscientiousness (Di Giannatale and Roa, 2016).

Furthermore, there is some evidence that personality traits are more malleable than cognitive characteristics over the course of a lifetime. Numerical skills become fixed between six or eight and it is therefore crucial that they be developed at an early age (Hopkins and Bracht, 1975; Schuerger and Witt, 1989). A small but growing group of studies has shown how certain interventions in childhood can alter personality traits and thereby promote effective achievements as adults (Heckman and Kautz, 2013; West *et al.*, 2015). More research is nevertheless needed on the mechanisms that produce change.

We hope that these results enrich understanding of the underlying processes and determinants of financial decision-making. Furthermore, we hope that they can help lay a foundation for the development of broad conceptual frameworks and interventions that promote financial inclusion and encourage people to make better financial decisions. This issue has special relevance since, as mentioned before, healthy financial decisions have been shown to have a significant impact on individual and social welfare, economic growth, inequality, and poverty.

References

- Agarwal, S. and Mazumder, B. (2013). 'Cognitive abilities and household financial decision making ', *American Economic Journal: Applied Economics*, vol. 5(1), pp. 193-207.
- Almlund, M., Duckworth, A. L., Heckman, J. and Kautz, T. (2011). 'Personality Psychology and Economics', *Handbook of the Economics of Education*, vol. 4(1), pp. 1-181.
- Atkinson, A. and Messy, F. (2012). 'Measuring Financial Literacy: Results of the OECD / International Network on Financial Education (INFE) Pilot Study'. OECD Working Papers on Finance, Insurance and Private Pensions, No. 15, OECD Publishing.
- Banks, J. and Oldfield, Z. (2007). 'Understanding Pensions: Cognitive Function, Numerical Ability and Retirement Saving', *Fiscal Studies*, vol. 28(2), pp. 143–70.
- Barbaranelli, C., Caprara, G. V., Rabasca, A. and Pastorelli, C. (2003). 'A questionnaire for measuring the Big Five in late childhood', *Personality and Individual Differences*, vol. 34(4), pp. 645-64.
- Baum, C. F., Schaffer, M. E. and Stillman, S. (2007). 'Enhanced routines for instrumental variables/GMM estimation and testing', *Stata Journal*, vol. 7(4), pp. 465-506.
- Becker, A., Deckers, T., Dohmen, T., Falk, A. and Kosse, F. (2012). 'The relationship between economic preferences and psychological personality measures', *Annual Review of Economics*, vol. 4(1), pp. 453-78.

Benjamin, D.J., Brown, S.A. and Shapiro J. M. (2013). 'Who is 'behavioral'? Cognitive ability and anomalous preferences', *Journal of the European Economic Association*, vol. 11(6), pp. 1231-55.

Behrman, J. R., Mitchell, O. S., Soo, C. K. and Brava, D. (2012). 'How financial literacy affects household wealth accumulation', *The American Economic Review*, vol. 102(3), pp. 300-04.

Borghans, L., Duckworth, A. L., Heckman, J. J. and Ter Weel, B. (2008). 'The economics and psychology of personality traits', *Journal of Human Resources*, vol. 43(4), pp. 972-1059.

Borghans, L., Golsteyn, B. H., Heckman, J. and Humphries, J. (2011). 'Identification problems in personality psychology', *Personality and Individual Differences (Special Issue on Personality and Economics)*, vol. 51(3), pp. 315-20.

Bucher-Koenen, T. and Lusardi, A. (2011). 'Financial literacy and retirement planning in Germany', *Journal of Pension Economics and Finance*, vol. 10(04), pp. 565-84.

Burks, S. V., Carpenter, J. P., Goette, L. and Rustichini, A. (2009). 'Cognitive skills affect economic preferences, strategic behavior, and job attachment', *Proceedings of the National Academy of Sciences*, vol. 106(19), pp. 7745-50.

Bross, I. D. (1958). 'How to use ridit analysis'. *Biometrics*, pp. 18-38.

Calderón, G., Iacovone, L., and Juaréz, L. (2015). 'Opportunity vs necessity: understanding the heterogeneity of female micro-entrepreneurs', World Bank (mimeo).

Cameron, A. C. and Trivedi, P. K. (2009). *Microeconometrics using stata (Vol. 5)*. College Station, TX: Stata Press.

Caprara, G. V., Barbaranelli, C., Borgogni, L. and Perugini, M. (1993). 'The "Big Five Questionnaire": a new questionnaire to assess the five factor model', *Personality and Individual Differences*, vol. 15(3), pp. 281-88.

Cattell, R.B. (1971). *Abilities: Their Structure, Growth, and Action*, Boston: Houghton Mifflin.

Cattell, R.B. (1987). *Intelligence: Its Structure, Growth and Action*, Amsterdam: Elsevier.

Ciavarella, M. A., Buchholtz, A. K., Riordan, C. M., Gatewood, R. D. and Stokes, G. S. (2004). 'The Big Five and venture survival: is there a linkage?', *Journal of Business Venturing*, vol. 19(4), pp. 465-83.

Christelis, D., Jappelli, T. and Padula, M. (2010). 'Cognitive abilities and portfolio choice', *European Economic Review*, vol. 54(1), pp. 18-38.

Cole, S.A. and Shastry, G.K. (2009). 'Smart money: the effect of education, cognitive ability, and financial literacy on financial market participation', Working Paper. Harvard Business School.

Cunha, F. and Heckman, J. J. (2008). 'Formulating, identifying and estimating the technology of cognitive and noncognitive skill formation', *Journal of Human Resources*, vol. 43(4), pp. 738-82.

Cunha, F., Heckman, J. J. and Schennach, S. M. (2010). 'Estimating the technology of cognitive and noncognitive skill formation', *Econometrica*, vol. 78(3), pp. 883-931.

Di Giannatale, S., Elbittar, A. and Roa, M. J. (2015). ‘Características de personalidad y cognitivas: efectos sobre el comportamiento de repago’, Centro de Estudios Monetarios Latinoamericanos, CEMLA.

Di Giannatale, S., and Roa, M. J. (2016). ‘Formal Saving in Developing Economies: Barriers, Interventions, and Effects’, Inter-American Development Bank Working Paper Series N° IDB-WP-766.

Delavande, A., Rohwedder, S. and Willis, R. J. (2008). ‘Preparation for retirement, financial literacy and cognitive resources’, Working Paper, University of Michigan.

Demirgüç-Kunt, A., Klapper, L. F., Singer, D. and Van Oudheusden, P. (2015). ‘The Global Findex Database 2014: measuring financial inclusion around the world’, Working Paper, World Bank Policy Research.

Dohmen, T., Falk, A., Huffman, D. and Sunde, U. (2010). ‘Are risk aversion and impatience related to cognitive ability?’, *The American Economic Review*, vol. 100(3), pp. 1238-60.

Fisher, I. (1930). *The Theory of Interest*, New York: Macmillan.

Frederick, S. (2005). ‘Cognitive reflection and decision making’, *The Journal of Economic Perspectives*, vol. 19(4), pp. 25-42.

Friedman, M. (1957). *A Theory of the Consumption Function*, NBER Books.

Garber, G. and Koyama, S. (2016). ‘Policy-effective Financial Knowledge and Attitude Factors’, Working Paper, Central Bank of Brazil.

Gerardi, K., Goette, L. and Meier, S. (2013). 'Numerical ability predicts mortgage default', *Proceedings of the National Academy of Sciences*, vol. 110(28), pp.11267–71.

Grinblatt, M., Keloharju, M., and Linnainmaa, J.T. (2012). 'IQ, trading behavior, and performance', *Journal of Financial Economics*, vol. 104(2), pp. 339-62.

Heckman, J. J. (1981). 'Heterogeneity and state dependence', in (Sherwin Rosen, ed.), *Studies in Labor Markets*, pp. 91-140, University of Chicago Press.

Heckman, J. J., Stixrud, J. and Urzua, S. (2006). 'The effects of cognitive and noncognitive abilities on labor market outcomes and social behavior', Working Paper. National Bureau of Economic Research.

Heckman, J. J. and Kautz, T. (2012). 'Hard evidence on soft skills', *Labour Economics*, vol. 19(4), pp. 451-64.

Heckman, J. J. and Kautz, T. (2013). 'Fostering and measuring skills: interventions that improve character and cognition', Working Paper, National Bureau of Economic Research.

Hopkins, K.D. and Bracht, G.H. (1975). 'Ten-year stability of verbal and nonverbal IQ scores', *American Educational Research Journal*, vol. 12(4), pp. 469–77.

Jamshidinavid, B., Chavoshani, C. and Amiri, S. (2012). 'The impact of demographic and psychological characteristics on the investment prejudices in Tehran stock', *European Journal of Business and Social Sciences*, vol. 1(5), pp. 41-53.

Jappelli, T. and Padula, M. (2011). 'Investment in financial literacy and saving decisions', Working Paper, Centre for Studies in Economics and Finance (CSEF).

John, O.P., Caspi, A., Robins, R.W. and Moffitt, T.E. (1994). 'The "Little Five": exploring the nomological network of the five-factor model of personality in adolescent boys', *Child Development*, vol. 65(1), pp. 160–78.

Kaufmann, C. (2012). 'The influence of information presentation, psychological mechanisms, and personal characteristics on households' financial decision making', Doctoral dissertation, Universität Mannheim.

Kausel, E. E., Hansen, E. and Tapia, P. (2016). 'Responsible personal finance: the role of conscientiousness in bank and pension savings in Chile', *International Review of Finance*, vol. 16(1), pp. 161-67.

Klapper, L.F., Lusardi, A. and Panos, G.A. (2012). 'Financial literacy and the financial crisis', Working Paper, World Bank.

Klapper, L., Lusardi, A. and Van Oudheusden, P. (2014). 'Financial literacy around the world'. *Insights From The Standard & Poor's Ratings Services Global Financial Literacy Survey*.

Klinger, B., Castro, L., Szenkman, P. and Khwaja, A. (2013a). 'Unlocking SME finance in Argentina with psychometrics', IDB Technical Note (Institutions for Development Sector. Fiscal and Municipal Management Division), IDB-TN-532.

Klinger, B., Khwaja, A. I. and del Carpio, C. (2013b). *Enterprising Psychometrics and Poverty Reduction*, Springer Science and Business Media.

Kolenikov, S. and Angeles, G. (2004). 'The use of discrete data in PCA: theory, simulations, and applications to socioeconomic indices', Working Paper, University of North Carolina.

Lee, J. and Newhouse, D. (2013). 'Cognitive skills and youth labor market outcomes', *Background Paper for the World Development Report 2013*.

Lopez-Calva, L. F. and Ortiz-Juarez, E. (2011). 'A vulnerability approach to the definition of the middle class', Working Paper, World Bank.

Lord, S. A. (2007). 'Systemic work with clients with a diagnosis of borderline personality disorder', *Journal of Family Therapy*, vol. 29(3), pp. 203-21.

Lusardi, A. and Mitchell, O. S. (2008). 'Planning and Financial Literacy: How Do Women Fare?', *American Economic Review*, vol. 98(2), pp. 413-17.

Lusardi, A. and Mitchell, O. S. (2009). 'How ordinary consumers make complex economic decisions: financial literacy and retirement readiness', Working Paper, National Bureau of Economic Research.

Lusardi, A., and Mitchell, O. S. (2011a). 'Financial literacy and planning: implications for retirement well-being', in (O. S. Mitchell and A. Lusardi, eds.), *Financial Literacy: Implications for Retirement Security and the Financial Marketplace*, pp. 17–39, Oxford and New York: Oxford University Press.

Lusardi, A. and Mitchell, O. S. (2011b). 'Financial literacy around the world: an overview', *Journal of Pension Economics and Finance*, vol. 10(04), pp. 497-508.

- Lusardi, A. and Mitchell, O. S. (2014). 'The economic importance of financial literacy: theory and evidence', *Journal of Economic Literature*, vol. 52(1), pp. 5-44.
- McArdle, J.J., Smith, J.P. and Willis, R. (2009). 'Cognition and economic outcomes in the Health and Retirement Survey', Working Paper, National Bureau of Economic Research.
- McCarthy, Y. (2011). 'Behavioral characteristics and financial distress', Working Paper, European Central Bank.
- Mejía, D., Pallotta, A., Egúsqiza, E. and Palán, C. (2015). 'Encuesta de medición de capacidades financieras en los países andinos, Informe comparativo 2014 (report)', Lima: CAF, <http://scioteca.caf.com/handle/123456789/740> (last accessed: 17 October 2016).
- Mejía, D. and Rodríguez, G., (2016). 'Determinantes socioeconómicos de la educación financiera. Evidencia para Bolivia, Colombia, Ecuador y Perú', Bogotá: CAF, <http://scioteca.caf.com/handle/123456789/835> (last accessed: 17 October 2016).
- Modigliani, F. and Brumberg, R. (1954). 'Utility analysis and the consumption function: an interpretation of cross-section data', *Franco Modigliani*, vol. 1.
- Nisbett, R. E., Aronson, J., Blair, C., Dickens, W., Flynn, J., Halpern, D. F. and Turkheimer, E. (2012). 'Intelligence: new findings and theoretical developments', *American Psychologist*, vol. 67(2), pp. 130-59.
- OECD/INFE. (2015). 'Supplementary questions: Optional survey questions for the OECD INFE financial literacy core questionnaire', <https://www.oecd.org/finance/financial-education/49878153.pdf> (last accessed: 10 March 2015).

Oechssler, J., Roider, A. and Schmitz, P. W. (2009). 'Cognitive abilities and behavioral biases', *Journal of Economic Behavior & Organization*, vol. 72(1), pp. 147-152.

Reinhart, C. M. and Rogoff, K. S. (2009). *This time is different: eight centuries of financial folly*. Princeton: Princeton University Press.

Roa, M. (2013). 'Inclusión financiera en América Latina y el Caribe: acceso, uso y calidad'. *Boletín CEMLA*, vol. 59(2), pp. 121-148.

Roberts, B. W., Kuncel, N. R., Shiner, R., Caspi, A. and Goldberg, L. R. (2007). 'The power of personality: The comparative validity of personality traits, socioeconomic status, and cognitive ability for predicting important life outcomes', *Perspectives on Psychological Science*, vol. 2(4), pp. 313-345.

Roberts, B. W. (2009). 'Back to the future: personality and assessment and personality development', *Journal of Research in Personality*, vol. 43(2), pp. 137-145.

Sahay R., Čihák M., N'Diaye P., Barajas A., Ayala Pena D., Bi R., Gao Y., Kyobe A., Nguyen L., Saborowski C., Svirydzenka K. and Yousefi R. (2015) 'Financial Inclusion: Can it Meet Multiple Macroeconomic Goals?' IMF Staff Discussion Notes from International Monetary Fund 15/17. Washington, D.C.

Schmidt, F. L. and Hunter, J. (2004) 'General mental ability in the world of work: occupational attainment and job performance', *Journal of personality and social psychology*, vol. 86(1), p. 162.

Schuerger, J.M. and Witt, A.C. (1989). 'The temporal stability of individually tested intelligence', *Journal of Clinical Psychology*, vol. 45(2), pp. 294-302.

Soto, C. J. and John, O. P. (2016). ‘The next Big Five inventory (BFI-2): developing and assessing a hierarchical model with 15 facets to enhance bandwidth, fidelity, and predictive power’, *Journal of Personality and Social Psychology*.

Stampini, M., Robles, M., Sáenz, M., Ibararán, P. and Medellín, N. (2015). ‘Poverty, vulnerability and the middle class in Latin America’, Working Paper, Inter-American Development Bank.

Stock, J. H. and Yogo, M. (2005). ‘Testing for weak instruments in linear IV regression’, in (D. W. K. Andrews and J. H. Stock, eds.), *Identification and Inference for Econometric Models: Essays in Honor of Thomas Rothenberg*, pp. 80–108. Cambridge: Cambridge University Press.

Van Rooij, M., Lusardi, A. and Alessie, R. (2011). ‘Financial literacy and stock market participation’, *Journal of Financial Economics*, vol. 101(2), pp. 449-472.

Wooldridge, J. M. (2010). *Econometric Analysis of Cross Section and Panel Data*, Massachusetts: MIT Press.

Zhao, H. and Seibert, S. E. (2006), ‘The big five personality dimensions and entrepreneurial status: a meta-analytical review’, *Journal of Applied Psychology*, vol. 91(2), p. 259.

Endnotes

ⁱ For a detailed review of the literature discussed in this section see Di Giannatale, S., and Roa, M. J. (2016).

ⁱⁱ Psychologists call this fluid intelligence. Overall, psychologists distinguish between two kinds of intelligence: fluid and crystallized (Cattell, 1971, 1987). Crystallized intelligence refers to knowledge acquired and is influenced, for the most part, by life experiences and education opportunities (Nisbett *et al.*, 2012).

ⁱⁱⁱ Due to the binary or dichotomist nature of the questions, we used the principal components method with matrices of polychoric correlations (Kolenikov and Angeles, 2004).

^{iv} Models were weighted using countries' sampling weights and aggregated by the over 18 population of each country with clustered standard errors in urban and rural areas within regions or departments, in order to mitigate potential selection bias due to the designs of the surveys.

^v Considering that the goal of our estimation was to approach the partial effect of the explanatory variables rather than marginal effects, it appears that our linear probability model is a better choice than nonlinear models (Wooldridge, 2010).

^{vi} Instruments commonly included are related to respondents' family backgrounds, such as the education of their parents. However, due to the absence of suitable questions in the survey, we could not include it.

^{vii} As with our OLS models, the GMM-IV models were weighted using countries' sampling weights and aggregated by the over 18 population of each country with clustered standard errors in urban and rural areas within regions or departments, in order to mitigate potential selection bias due to the designs of the surveys.

Table 1: Respondents' Sociodemographic Profile, by Country (Number of Adults)

	Peru	Bolivia	Colombia	Ecuador	Total
<i>A. Age groups</i>					
18-29	411	427	341	421	1600
30-39	317	294	275	302	1188
40-49	212	181	242	214	849
50-59	135	147	209	132	623
60-69	104	101	127	90	422
>70	31	50	67	41	189
<i>B. Gender</i>					
Male	603	600	586	599	2388
Female	607	600	675	601	2483
<i>C. Marital status</i>					
Married	378	521	385	497	1781
Single	366	369	395	341	1471
Separated/divorced	58	44	74	100	276
Free union	366	210	342	223	1141
Widow/widower	40	53	62	35	190
No answer	2	3	3	4	12
<i>D. Employment status</i>					
I am self-employed, I am my own boss and have no employees	412	456	350	326	1544
I am a business-owner with at least one worker	41	78	61	58	238
I am in full-time formal employment	224	181	246	306	957
I am in part-time formal employment	94	127	87	101	409
I am a student	102	115	69	85	371
I dedicate myself to housework and family	232	165	240	228	865
I am retired (receiving a pension)	30	35	53	25	143
I am unemployed	35	20	102	51	208
I am not working due to disability or prolonged illness	7	7	22	5	41
I am living off rental income, such as rents, profits, interests and/or dividends	11	7	9	6	33
Other	15	4	16	6	41
No answer	7	5	6	3	21
<i>E. Stable income</i>					
Yes	656	873	846	680	3055
No	501	296	383	497	1677
Do not know	40	23	23	10	96
No answer	13	8	9	13	43
<i>F. Education level</i>					
Incomplete secondary or lower	332	517	523	472	1844
Secondary	408	245	382	386	1421
Incomplete technical education	55	45	39	14	153
Technical education	162	123	141	31	457
Incomplete undergraduate	119	117	60	166	462
Undergraduate	124	134	105	125	488
Graduate	10	19	11	6	46
<i>G. Income group</i>					
Poor and vulnerable class (up to US\$ 400)	659	834	654	699	2846
Middle class (from US\$ 401 to US\$ 1600)	319	292	420	443	1474
Upper class (more than US\$ 1600)	13	15	37	26	91
No answer	219	59	150	32	460
<i>Total</i>	1,210	1,200	1,261	1,200	4,871

Table 2: The Four Standard Questions of Financial Literacy

	<i>Percentages</i>				Total
	Peru	Bolivia	Colombia	Ecuador	
<i>A. Inflation</i>					
Correct answer	39.1	43.2	47.1	43.6	44.7
Incorrect answer	34.4	39.6	35.1	45.3	37.1
Do not know	21.9	15.4	16.1	10.5	16.2
Irrelevant response	0.5	0.2	0.2	0.1	0.2
No answer	4.0	1.7	1.5	0.6	1.8
<i>B. Simple interest</i>					
Correct answer	16.4	26.8	13.2	25.0	16.8
Incorrect answer	30.3	29.5	38.1	44.3	36.6
Do not know	46.9	40.2	46.0	29.1	43.1
Irrelevant response	1.5	1.0	0.0	0.3	0.5
No answer	4.9	2.5	2.7	1.3	3.0
<i>C. Compound interest</i>					
Correct answer	29.7	33.3	34.3	40.7	33.6
Incorrect answer	27.6	35.4	27.9	37.0	30.3
Do not know	36.2	28.6	35.9	21.4	33.4
No answer	6.5	2.7	2.0	0.9	2.8
<i>D. Risk diversification</i>					
Correct answer	60.0	62.7	69.9	66.3	67.4
Incorrect answer	26.5	26.3	24.7	29.3	25.3
Do not know	10.9	9.7	4.4	4.3	6.1
No answer	2.6	1.4	1.0	0.3	1.3
<i>E. Total percentage of financially literate adults</i>					
At least 3 correct answers	16.2	21.9	19.9	23.0	19.6

Note: sampling weights are used.

Table 3. PRIDIT Index for Financial Literacy: Percentage of Correct Answers and PRIDIT Weighting Scheme

Question	Correct (%)	PRIDIT Weights
Q1: Now imagine that the brothers have to wait one year to receive their share of the \$X and inflation remains at an annual rate of 2%. After a year, they will be able to buy ...? [4 options; Do not know; No answer; Irrelevant response]	43.8%	0.382
Q2: Imagine that you lent a friend \$X one evening and that he returned that \$X the following day. Did your friend pay any interest for this loan? [Yes; No; Do not know; No answer]	87.7%	0.372
Q3: Let's assume you have \$100 in a savings account that pays a 2% annual interest rate. You do not pay in any other money nor do you pay anything out (...) And considering the same 2% interest rate, how much would you have in the account at the end of five years? [4 options; Do not know; No answer]	34.1%	0.247
Q4: I would like to know if you consider the following statements true or false: 1) When you invest a lot of money, there is also a possibility of losing a lot of money. [True; False; Do not know; No answer]	83.3%	0.400
Q5: I would like to know if you consider the following statements true or false: 2) High inflation means that the cost of living is rising quickly. [True; False; Do not know; No answer]	81.0%	0.511
Q6: I would like to know if you consider the following statements true or false: 3) The probability of losing all your money is lower if you invest it in more than one place. [True; False; Do not know; No answer]	65.2%	0.485

Table 4: Survey Questions Related to Conscientiousness

Selected questions	Sub-facet of conscientiousness
a) Does your family have a budget? [Yes; No; Do not know]	Propensity for planning or establishing long term goals
b) Does your family use this budget to plan the use of money in a precise manner or to have a general plan for the use of money? [Exact; General; Do not know]	Scrupulosity
c) Does your family follow this plan for the use of money? [Always; Sometimes; Never; Do not know]	Perseverance
d) Sometimes people find that their income does not quite cover their living costs. In the last 12 months, has this happened to you? [Yes; No; Do not know]	Propensity for planning or establishing long term goals; perseverance
e) Before buying something I carefully consider if I can afford it. [Totally agree; Totally disagree (5 categories)]	Scrupulosity
f) I pay my bills on time [Totally agree; Totally disagree (5 categories)]	Perseverance
g) I set myself long-term financial goals and strive to achieve them [Totally agree; Totally disagree (5 categories)]	Propensity for planning or establishing long term goals; perseverance in the effort

Table 5: Survey Questions Related to Risk and Time Preferences

Statements	Valuation criteria (5 options)	
	Totally agree	Totally disagree
<i>Risk preferences</i>		
“I am prepared to risk some of my own money when making an investment”	Risk loving or neutral	Risk averse
<i>Time preferences</i>		
“I tend to live for today and let tomorrow take care of itself”	Short term	Long term
“I find it more satisfying to spend money than to save it for the long term”	Short term	Long term
“Money is there to be spent”	Short term	Long term

Table 6: Financial Decision Variables, by Country

	Peru	Bolivia	Colombia	Ecuador	Total
	%	%	%	%	%
<i>V1. 1 Holding any formal savings products; 0 otherwise</i>					
0	72.3	58.0	60.9	32.8	59.1
1	27.7	42.0	39.1	67.2	40.9
<i>V2. 1 Saved in the last 12 months (formal or informal mechanisms); 0 otherwise</i>					
0	48.8	29.3	41.5	43.8	42.6
1	51.2	70.8	58.5	56.3	57.4
<i>V3. 1 Saved in the last 12 months through at least one formal mechanism; 0 otherwise</i>					
0	80.2	64.8	78.6	82.9	78.3
1	19.8	35.3	21.4	17.1	21.7
<i>V4. 1 Saved in the last 12 months only through informal mechanisms; 0 otherwise</i>					
0	68.6	70.4	62.9	92.8	64.3
1	31.4	29.6	37.1	7.2	35.7
<i>V5. 1 Holding any formal credit product; 0 otherwise</i>					
0	77.5	71.4	73.2	92.8	76.8
1	22.5	28.6	26.8	7.2	23.2
<i>Total</i>	100	100	100	100	100

Note: Sampling weights are used.

Table 7: Conscientiousness and Financial Decisions.

	Score de características de diligencia				Mean difference between (0) and (1)
	P(25)	P(50)	P(75)	Mean	
<i>V1. 1 Holding any formal savings products; 0 otherwise</i>					
0	0.63	0.69	0.80	0.71	-0.06***
1	0.69	0.78	0.87	0.77	
<i>V2. 1 Saved in the last 12 months (formal or informal mechanisms); 0 otherwise</i>					
0	0.60	0.69	0.80	0.70	-0.06***
1	0.68	0.76	0.86	0.76	
<i>V3. 1 Saved in the last 12 months through at least one formal mechanism; 0 otherwise</i>					
0	0.63	0.70	0.81	0.72	-0.07***
1	0.70	0.81	0.88	0.79	
<i>V4. 1 Saved in the last 12 months only through informal mechanisms; 0 otherwise</i>					
0	0.63	0.72	0.83	0.73	-0.01***
1	0.66	0.75	0.84	0.74	
<i>V5. 1 Holding any formal credit products; 0 otherwise</i>					
0	0.63	0.70	0.82	0.72	-0.06***
1	0.69	0.79	0.87	0.78	

Note: Sampling weights are used. Test of differences in means * p < 0.10, ** p < 0.05, *** p < 0.01.

Table 8: Financial Decisions (Only Affirmative Financial Decisions), Financial Literacy and Sociodemographic Characteristics

	V1. Holding savings products (1)	V2. Saved (formally and/or informally) (1)	V3. Saved formally (1)	V4. Saved informally (1)	V5. Holding credit products (1)
	%	%	%	%	%
<i>A. Financial literacy (2/3) - excluding numeracy</i>					
No	33.8	53.2	18.3	35.0	17.4
Yes	47.1	61.1	24.7	36.4	28.2
<i>B. Cognition (numeracy)</i>					
No	36.3	55.0	19.5	35.6	20.9
Yes	63.6	69.2	32.6	36.5	34.1
<i>C. Risk preferences</i>					
Risk loving or neutral	38.5	50.6	18.5	32.1	20.5
Risk averse	41.6	59.4	22.6	36.8	23.9
<i>D. Time preferences</i>					
Short term	36.7	51.8	16.9	34.9	18.5
Long term	42.5	59.6	23.5	36.1	24.9
<i>E. Age groups</i>					
18-29	44.3	66.8	24.0	42.8	20.5
30-39	47.0	58.9	22.6	36.3	28.1
40-49	38.8	57.7	22.8	35.0	23.8
50-59	36.6	48.5	20.9	27.7	24.5
60-69	31.9	45.0	14.1	30.9	20.8
>70	26.6	38.3	14.5	23.8	12.8
<i>F. Gender</i>					
Male	45.9	58.8	26.3	32.5	26.3
Female	36.3	56.1	17.4	38.7	20.2
<i>G. Country</i>					
Peru	35.0	54.2	24.5	29.8	27.8
Bolivia	42.0	70.8	35.3	35.5	28.6
Colombia	35.8	56.3	19.5	36.8	24.8
Ecuador	67.2	56.3	17.1	39.2	7.2
<i>H. Marital status</i>					
Married	45.3	57.1	24.5	32.6	27.0
Single	41.7	58.9	22.7	36.2	19.7
Separated/divorced	42.5	51.9	17.0	35.0	23.8
Free union	36.4	59.0	19.0	40.0	23.6
Widow/widower	25.2	46.3	13.2	33.0	14.6
No answer	23.6	75.0	33.7	41.3	9.8
<i>I. Employment status</i>					
I am self-employed, I am my own boss and have no employees	34.1	55.9	19.5	36.4	24.9
I am a business-owner with at least one worker	62.0	76.7	38.6	38.1	39.2
I am in full-time formal employment	65.9	65.9	32.8	33.1	34.1
I am in part-time formal employment	49.0	67.6	29.5	38.1	22.5
I am a student	39.4	67.2	23.4	43.8	16.6
I dedicate myself to housework and family	22.8	46.5	9.3	37.2	9.6
I am retired (receiving a pension)	52.9	54.5	32.8	21.7	34.5
I am unemployed	25.5	42.3	7.8	34.5	12.4
I am not working due to disability or prolonged illness	12.6	28.1	1.0	27.1	8.1
I am living off rental income, such as rents, profits, interests and/or dividends	32.7	62.5	31.4	31.1	38.3
Other	30.5	46.7	14.5	32.2	16.2
No answer	16.4	34.0	5.7	28.3	11.8
<i>J. Stable income</i>					

Yes	47.3	64.5	26.6	37.9	28.5
No	29.6	45.0	12.9	32.1	13.5
Do not know	28.9	42.9	12.8	30.0	16.3
No answer	29.2	44.9	16.7	28.3	18.3
<i>K. Education level</i>					
Incomplete secondary or less	23.6	46.0	11.5	34.5	13.7
Secondary	39.7	57.2	18.4	38.8	22.3
Incomplete technical education	37.5	66.5	21.2	45.2	25.3
Technical education	60.1	69.4	33.6	35.8	34.3
Incomplete undergraduate	64.3	72.9	34.5	38.4	29.2
Undergraduate	72.7	73.9	46.9	26.9	43.7
Graduate	94.7	90.8	71.9	18.9	65.8
<i>L. Income groups</i>					
Poor and vulnerable class (up to U\$ 400)	30.9	50.9	15.1	35.8	15.8
Middle class (from U\$ 401 to U\$ 1600)	58.5	70.8	32.1	38.7	32.7
Upper class (more than U\$ 1600)	67.0	78.0	49.5	28.5	52.3

Note: "affirmative financial decisions" accounts for respondents who hold a formal savings product (V1), decided to save (V2), to save through formal mechanisms (V3), to save only through informal mechanisms (V4), and/or hold a formal credit product (V5). These respondents have the value of one (1) in each binary indicator. Sampling weights are used.

Table 9: OLS Estimates - Holding Formal Savings Products (VI)

	(1)	(2)	(3)	(4)	(5)
Financial literacy (2/3)	0.0472 ^{***} (0.0177)	-0.0125 (0.0169)			
Conscientiousness	0.814 ^{***} (0.0666)	0.507 ^{***} (0.0695)	0.806 ^{***} (0.0670)	0.501 ^{***} (0.0695)	0.504 ^{***} (0.0691)
Cognition (simple interest)	0.233 ^{***} (0.0220)	0.120 ^{***} (0.0217)	0.246 ^{***} (0.0208)	0.114 ^{***} (0.0209)	0.115 ^{***} (0.0208)
Female		-0.0537 ^{***} (0.0158)		-0.0528 ^{***} (0.0158)	-0.0531 ^{***} (0.0158)
Stable income		0.0523 ^{***} (0.0171)		0.0518 ^{***} (0.0171)	0.0522 ^{***} (0.0171)
Age (Years)		0.00194 (0.00303)		0.00166 (0.00303)	0.00176 (0.00303)
Age-squared		-0.0000289 (0.0000327)		-0.0000260 (0.0000328)	-0.0000270 (0.0000327)
Education: secondary		0.101 ^{***} (0.0205)		0.0996 ^{***} (0.0205)	0.100 ^{***} (0.0205)
Education: incomplete technical		0.122 ^{**} (0.0507)		0.121 ^{**} (0.0508)	0.121 ^{**} (0.0508)
Education: technical		0.292 ^{***} (0.0318)		0.290 ^{***} (0.0319)	0.291 ^{***} (0.0318)
Education: incomplete undergraduate		0.244 ^{***} (0.0330)		0.241 ^{***} (0.0330)	0.243 ^{***} (0.0329)
Education: undergraduate		0.319 ^{***} (0.0316)		0.316 ^{***} (0.0318)	0.317 ^{***} (0.0316)
Education: graduate		0.495 ^{***} (0.0412)		0.491 ^{***} (0.0407)	0.492 ^{***} (0.0407)
Married		0.0260 (0.0196)		0.0260 (0.0196)	0.0260 (0.0196)
Single		-0.00505 (0.0219)		-0.00440 (0.0219)	-0.00477 (0.0219)
Separated/divorced		0.0341 (0.0359)		0.0344 (0.0358)	0.0342 (0.0358)
Unemployed		-0.0689 [*] (0.0343)		-0.0700 ^{**} (0.0343)	-0.0695 ^{**} (0.0343)
Middle class (from US\$ 401 to US\$ 1600)		0.116 ^{***} (0.0194)		0.115 ^{***} (0.0194)	0.115 ^{***} (0.0194)
Upper class (more than US\$ 1600)		0.130 ^{**} (0.0587)		0.129 ^{**} (0.0588)	0.129 ^{**} (0.0588)
Bolivia		0.0641 ^{***} (0.0190)		0.0634 ^{***} (0.0190)	0.0635 ^{***} (0.0190)
Colombia		0.0320 [*] (0.0184)		0.0299 (0.0185)	0.0312 [*] (0.0183)
Ecuador		0.328 ^{***} (0.0184)		0.326 ^{***} (0.0184)	0.327 ^{***} (0.0184)
PRIDIT			0.0221 ^{***} (0.00656)	0.00331 (0.00639)	
Constant	-0.255 ^{***}	-0.186 ^{**}	-0.228 ^{***}	-0.180 ^{**}	-0.185 ^{**}

	(0.0473)	(0.0836)	(0.0483)	(0.0844)	(0.0837)
Observations	4871	4709	4871	4709	4709
R-squared	0.0898	0.228	0.0905	0.228	0.228
Controls	No	Yes	No	Yes	Yes

Note: Least squares estimates weighted using countries' sampling weights and aggregated by the over 18 population of each country and robust standard errors adjusted for 131 clusters (urban and rural by region/department). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 10: OLS Estimates - Saved in the Last 12 Months through Formal and/or Informal Mechanisms (V2)

	(1)	(2)	(3)	(4)	(5)
Financial literacy (2/3)	0.0195 (0.0184)	-0.00557 (0.0182)			
Conscientiousness	0.906*** (0.0660)	0.648*** (0.0710)	0.923*** (0.0664)	0.657*** (0.0711)	0.646*** (0.0708)
Cognition (simple interest)	0.112*** (0.0213)	0.0524** (0.0211)	0.122*** (0.0198)	0.0540*** (0.0200)	0.0503** (0.0199)
Female		-0.00175 (0.0170)		-0.00282 (0.0170)	-0.00148 (0.0170)
Stable income		0.0892*** (0.0190)		0.0910*** (0.0190)	0.0891*** (0.0189)
Age (Years)		-0.00615* (0.00323)		-0.00575* (0.00323)	-0.00623* (0.00323)
Age-squared		0.0000167 (0.0000352)		0.0000127 (0.0000351)	0.0000176 (0.0000351)
Education: secondary		0.0176 (0.0223)		0.0201 (0.0223)	0.0172 (0.0222)
Education: incomplete technical		0.0931* (0.0508)		0.0949* (0.0507)	0.0929* (0.0508)
Education: technical		0.0848*** (0.0317)		0.0882*** (0.0316)	0.0842*** (0.0317)
Education: incomplete undergraduate		0.0781** (0.0306)		0.0831*** (0.0306)	0.0773** (0.0304)
Education: undergraduate		0.0802** (0.0318)		0.0861*** (0.0318)	0.0794** (0.0318)
Education: graduate		0.191*** (0.0610)		0.196*** (0.0612)	0.190*** (0.0610)
Married		-0.0221 (0.0220)		-0.0217 (0.0219)	-0.0221 (0.0220)
Single		-0.0559** (0.0229)		-0.0575** (0.0230)	-0.0557** (0.0229)
Separated/divorced		-0.0277 (0.0390)		-0.0285 (0.0389)	-0.0276 (0.0390)
Unemployed		-0.0897** (0.0415)		-0.0876** (0.0416)	-0.0899** (0.0415)
Middle class (from US\$ 401 to US\$ 1600)		0.112*** (0.0193)		0.113*** (0.0193)	0.112*** (0.0193)
Upper class (more than US\$ 1600)		0.152*** (0.0517)		0.155*** (0.0517)	0.152*** (0.0515)
Bolivia		0.141*** (0.0192)		0.141*** (0.0192)	0.140*** (0.0192)
Colombia		0.0149 (0.0195)		0.0205 (0.0196)	0.0145 (0.0195)
Ecuador		0.00704 (0.0194)		0.00981 (0.0194)	0.00655 (0.0193)
PRIDIT			-0.00568 (0.00703)	-0.0156** (0.00688)	

Constant	-0.122** (0.0486)	0.191** (0.0890)	-0.126** (0.0495)	0.170* (0.0896)	0.192** (0.0891)
Observations	4871	4709	4871	4709	4709
R-squared	0.0647	0.130	0.0646	0.131	0.130
Controls	No	Yes	No	Yes	Yes

Note: Least squares estimates weighted using countries' sampling weights and aggregated by the over 18 population of each country and robust standard errors adjusted for 131 clusters (urban and rural by region/department). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 11: OLS Estimates – Saved in the Last 12 Months through at least One Formal Product (V3)

	(1)	(2)	(3)	(4)	(5)
Financial literacy (2/3)	0.0119 (0.0146)	-0.0154 (0.0144)			
Conscientiousness	0.722*** (0.0570)	0.494*** (0.0581)	0.718*** (0.0569)	0.491*** (0.0581)	0.490*** (0.0578)
Cognition (simple interest)	0.110*** (0.0202)	0.0329* (0.0199)	0.112*** (0.0192)	0.0274 (0.0191)	0.0270 (0.0191)
Female		-0.0657*** (0.0137)		-0.0651*** (0.0137)	-0.0650*** (0.0137)
Stable income		0.0288** (0.0139)		0.0288** (0.0139)	0.0287** (0.0139)
Age (Years)		-0.0000725 (0.00262)		-0.000244 (0.00265)	-0.000290 (0.00264)
Age-squared		-0.00000517 (0.0000281)		-0.00000340 (0.0000283)	-0.00000293 (0.0000283)
Education: secondary		0.0294* (0.0163)		0.0286* (0.0163)	0.0284* (0.0163)
Education: incomplete technical		0.0554 (0.0411)		0.0550 (0.0411)	0.0548 (0.0411)
Education: technical		0.140*** (0.0278)		0.139*** (0.0278)	0.138*** (0.0278)
Education: incomplete undergraduate		0.133*** (0.0304)		0.131*** (0.0305)	0.130*** (0.0304)
Education: undergraduate		0.232*** (0.0316)		0.230*** (0.0316)	0.230*** (0.0316)
Education: graduate		0.406*** (0.0868)		0.403*** (0.0869)	0.402*** (0.0870)
Married		0.0207 (0.0173)		0.0207 (0.0173)	0.0207 (0.0173)
Single		0.00135 (0.0187)		0.00153 (0.0187)	0.00169 (0.0187)
Separated/divorced		-0.0108 (0.0290)		-0.0108 (0.0290)	-0.0107 (0.0290)
Unemployed		-0.0801*** (0.0236)		-0.0806*** (0.0237)	-0.0808*** (0.0237)
Middle class (from US\$ 401 to US\$ 1600)		0.0751*** (0.0170)		0.0746*** (0.0170)	0.0745*** (0.0170)
Upper class (more than US\$ 1600)		0.189*** (0.0546)		0.189*** (0.0548)	0.188*** (0.0548)
Bolivia		0.0903*** (0.0181)		0.0896*** (0.0180)	0.0895*** (0.0180)
Colombia		-0.0504*** (0.0164)		-0.0508*** (0.0165)	-0.0513*** (0.0163)
Ecuador		-0.0787*** (0.0164)		-0.0798*** (0.0164)	-0.0801*** (0.0163)
PRIDIT			0.00732 (0.00527)	-0.00149 (0.00531)	

Constant	-0.340*** (0.0392)	-0.108 (0.0717)	-0.332*** (0.0397)	-0.109 (0.0724)	-0.107 (0.0718)
Observations	4871	4709	4871	4709	4709
R-squared	0.0627	0.147	0.0629	0.147	0.147
Controls	No	Yes	No	Yes	Yes

Note: Least squares estimates weighted using countries' sampling weights and aggregated by the over 18 population of each country and robust standard errors adjusted for 131 clusters (urban and rural by region/department). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 12: OLS Estimates – Saved in the last 12 Months Only through Informal Mechanisms (V4)

	(1)	(2)	(3)	(4)	(5)
Financial literacy (2/3)	0.00765 (0.0182)	0.00981 (0.0185)			
Conscientiousness	0.184*** (0.0675)	0.154** (0.0721)	0.205*** (0.0679)	0.166** (0.0721)	0.157** (0.0718)
Cognition (simple interest)	0.00201 (0.0224)	0.0195 (0.0225)	0.00939 (0.0212)	0.0266 (0.0215)	0.0233 (0.0215)
Female		0.0640*** (0.0173)		0.0623*** (0.0173)	0.0635*** (0.0173)
Stable income		0.0604*** (0.0189)		0.0621*** (0.0189)	0.0605*** (0.0189)
Age (Years)		-0.00607* (0.00321)		-0.00551* (0.00320)	-0.00594* (0.00320)
Age-squared		0.0000219 (0.0000343)		0.0000161 (0.0000343)	0.0000205 (0.0000342)
Education: secondary		-0.0118 (0.0223)		-0.00852 (0.0223)	-0.0111 (0.0223)
Education: incomplete technical		0.0377 (0.0512)		0.0399 (0.0510)	0.0381 (0.0512)
Education: technical		-0.0549* (0.0331)		-0.0504 (0.0330)	-0.0540 (0.0330)
Education: incomplete undergraduate		-0.0545 (0.0345)		-0.0479 (0.0346)	-0.0532 (0.0344)
Education: undergraduate		-0.152*** (0.0318)		-0.144*** (0.0318)	-0.150*** (0.0316)
Education: graduate		-0.215*** (0.0738)		-0.207*** (0.0746)	-0.213*** (0.0738)
Married		-0.0427* (0.0221)		-0.0425* (0.0221)	-0.0428* (0.0221)
Single		-0.0572** (0.0239)		-0.0590** (0.0239)	-0.0574** (0.0239)
Separated/divorced		-0.0169 (0.0387)		-0.0178 (0.0386)	-0.0169 (0.0387)
Unemployed		-0.00959 (0.0413)		-0.00704 (0.0414)	-0.00915 (0.0413)
Middle class (from US\$ 401 to US\$ 1600)		0.0373* (0.0201)		0.0383* (0.0201)	0.0377* (0.0201)
Upper class (more than US\$ 1600)		-0.0372 (0.0593)		-0.0333 (0.0598)	-0.0367 (0.0597)
Bolivia		0.0504** (0.0200)		0.0512** (0.0199)	0.0508** (0.0199)
Colombia		0.0652*** (0.0197)		0.0713*** (0.0198)	0.0659*** (0.0196)
Ecuador		0.0858*** (0.0196)		0.0896*** (0.0196)	0.0866*** (0.0195)
PRIDIT			-0.0130* (0.00704)	-0.0141** (0.00716)	
Constant	0.217*** (0.0490)	0.300*** (0.0908)	0.206*** (0.0498)	0.279*** (0.0914)	0.299*** (0.0907)

Observations	4871	4709	4871	4709	4709
R-squared	0.00248	0.0407	0.00342	0.0417	0.0406
Controls	No	Yes	No	Yes	Yes

Note: Least squares estimates weighted using countries' sampling weights and aggregated by the over 18 population of each country and robust standard errors adjusted for 131 clusters (urban and rural by region/department). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 13: OLS Estimates: Holding Any Formal Credit Product (V5)

	(1)	(2)	(3)	(4)	(5)
Financial literacy (2/3)	0.0657*** (0.0158)	0.0417*** (0.0156)			
Conscientiousness	0.598*** (0.0594)	0.364*** (0.0629)	0.602*** (0.0598)	0.371*** (0.0630)	0.376*** (0.0625)
Cognition (simple interest)	0.0882*** (0.0222)	0.0490** (0.0218)	0.110*** (0.0206)	0.0632*** (0.0207)	0.0648*** (0.0207)
Female		-0.0403*** (0.0147)		-0.0418*** (0.0147)	-0.0424*** (0.0147)
Stable income		0.0597*** (0.0152)		0.0593*** (0.0152)	0.0601*** (0.0152)
Age (Years)		0.00939*** (0.00260)		0.00977*** (0.00261)	0.00998*** (0.00261)
Age-squared		-0.000103*** (0.0000273)		-0.000107*** (0.0000274)	-0.000109*** (0.0000274)
Education: secondary		0.0527*** (0.0189)		0.0541*** (0.0190)	0.0554*** (0.0189)
Education: incomplete technical		0.0831* (0.0430)		0.0840* (0.0430)	0.0848** (0.0431)
Education: technical		0.105*** (0.0300)		0.107*** (0.0301)	0.109*** (0.0300)
Education: incomplete undergraduate		0.109** (0.0311)		0.112*** (0.0311)	0.115*** (0.0310)
Education: undergraduate		0.169*** (0.0312)		0.172*** (0.0313)	0.175*** (0.0313)
Education: graduate		0.292*** (0.0855)		0.299*** (0.0852)	0.302*** (0.0851)
Married		0.0234 (0.0189)		0.0231 (0.0190)	0.0233 (0.0190)
Single		-0.0359* (0.0203)		-0.0361* (0.0203)	-0.0368* (0.0204)
Separated/divorced		0.0282 (0.0331)		0.0284 (0.0331)	0.0280 (0.0332)
Unemployed		-0.0463 (0.0312)		-0.0455 (0.0311)	-0.0444 (0.0311)
Middle class (from US\$ 401 to US\$ 1600)		0.0671*** (0.0180)		0.0686*** (0.0180)	0.0689*** (0.0180)
Upper class (more than US\$ 1600)		0.208*** (0.0597)		0.208*** (0.0602)	0.210*** (0.0602)
Bolivia		-0.0151 (0.0181)		-0.0133 (0.0182)	-0.0131 (0.0182)
Colombia		-0.0349** (0.0174)		-0.0348** (0.0176)	-0.0322* (0.0174)
Ecuador		-0.222*** (0.0150)		-0.220*** (0.0150)	-0.218*** (0.0149)
PRIDIT			0.0197*** (0.00588)	0.00687 (0.00592)	
Constant	-0.259***	-0.253***	-0.232***	-0.246***	-0.256***

	(0.0410)	(0.0774)	(0.0421)	(0.0782)	(0.0775)
Observations	4871	4709	4871	4709	4709
R-squared	0.0531	0.138	0.0508	0.136	0.136
Controls	No	Yes	No	Yes	Yes

Note: Least squares estimates weighted using countries' sampling weights and aggregated by the over 18 population of each country and robust standard errors adjusted for 131 clusters (urban and rural by region/departement). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 14: PRIDIT-GMM-IV- First-Stage Estimates

	(1)
Conscientiousness	0.561** (0.249)
Cognition (simple interest)	0.233*** (0.0634)
Female	-0.0546 (0.0433)
Stable income	0.112** (0.0533)
Age (Years)	0.0420*** (0.00938)
Age squared	-0.000405*** (0.0000947)
Education: secondary	0.181*** (0.0501)
Education: incomplete technical	0.0942 (0.164)
Education: technical	0.245*** (0.0758)
Education: incomplete undergraduate	0.333*** (0.0906)
Education: undergraduate	0.393*** (0.0827)
Education: graduate	0.347** (0.165)
Married	0.0251 (0.0649)
Single	-0.123** (0.0540)
Separated/divorced	-0.0480 (0.109)
Unemployed	0.0260 (0.0411)
Middle class (from US\$ 401 to US\$ 1600)	0.244*** (0.0804)

Upper class (more than US\$ 1600)	0.157 (0.101)
Bolivia	0.315** (0.127)
Colombia	0.605*** (0.121)
Ecuador	0.415*** (0.122)
<hr/> <i>Instruments:</i> <hr/>	
<i>No. of universities</i>	-0.00149* (0.000887)
<i>Accumulated banking crises</i>	-0.274*** (0.0629)
<i>Knowledge: Deposit Insurance Fund</i>	0.129** (0.0548)
<i>Risk preferences</i>	0.118** (0.0524)
<i>Knowledge: mutual funds and/or stock markets</i>	0.0642 (0.0579)
<i>Knowledge: insurance</i>	0.115* (0.0681)
Constant	-1.433*** (0.290)
Observations	4709
F-Test of excluded instruments (6,130)	9.11
P(F-Test of excluded instruments)	0.0000
Kleibergen-Paap LM test	32.10
Kleibergen-Paap LM test (p-value)	0.0000
Kleibergen-Paap Wald stat	9.11
Stock-Yogo (2005) critical values	
10% maximum IV relative bias	11.12
20% maximum IV relative bias	6.76

Note: Two-stage feasible GMM estimates, weighted using countries' sampling weights and aggregated by total population from 18 years old in each country, and robust standard errors adjusted for 131 clusters (urban and rural by region/department). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The F-Test of excluded instruments has as null hypothesis that the set of instruments are jointly nonsignificant to estimate financial literacy. The Kleibergen-Paap LM test of underidentification has as null hypothesis that the reduced-form matrix is underidentified (vs. the alternative hypothesis of exact identification). The Kleibergen-Paap Wald F-test reflects the maximum relative bias of the IV estimates when compared to OLS estimators. Following the approach suggested in Baum et al. (2007) we apply the critical values tabulated by Stock and Yogo (2005).

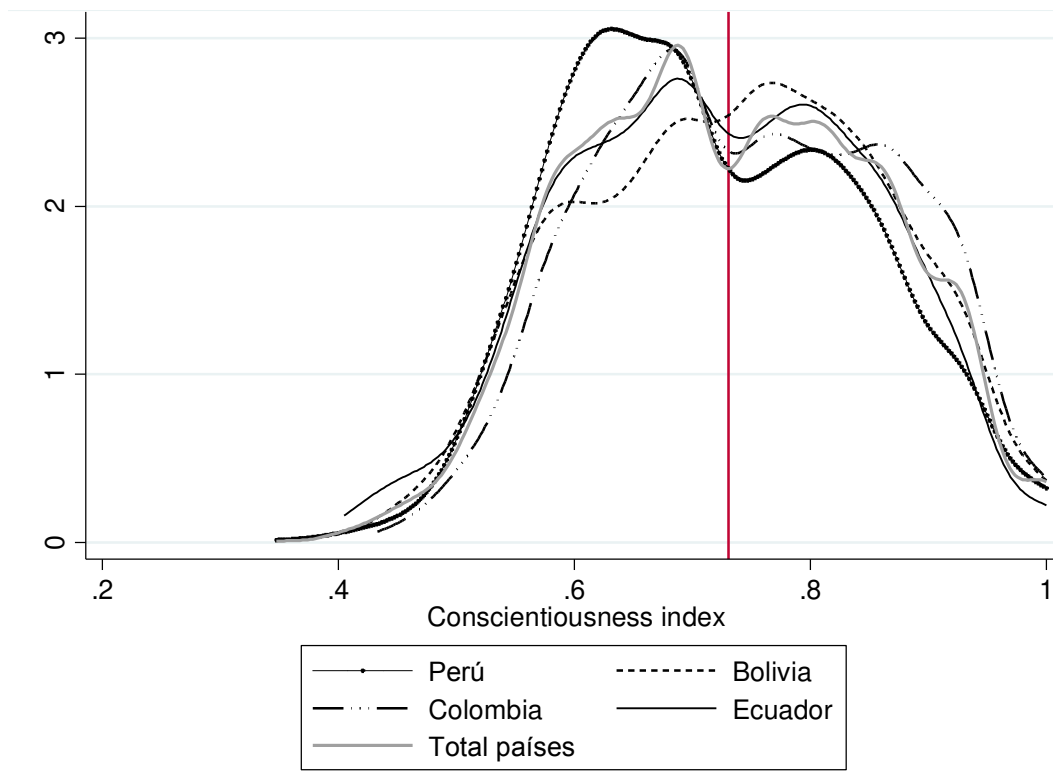
Table 15: GMM-IV Second-Stage Estimates for PRIDIT-IV

	(V1)	(V2)	(V3)	(V4)	(V5)
PRIDIT	0.101*	0.0215	0.0846*	-0.0884*	0.109***
	(0.0569)	(0.0594)	(0.0464)	(0.0487)	(0.0395)
Conscientiousness	0.478***	0.612***	0.477***	0.245***	0.284***
	(0.0854)	(0.0730)	(0.0678)	(0.0711)	(0.0563)
Cognition (simple interest)	0.0913***	0.0519**	0.00220	0.0559*	0.0384*
	(0.0266)	(0.0216)	(0.0238)	(0.0252)	(0.0197)
Female	-0.0256	0.00310	-0.0476***	0.0547***	-0.0329**
	(0.0209)	(0.0159)	(0.0180)	(0.0168)	(0.0110)
Stable income	0.0496**	0.0848***	0.0157	0.0680***	0.0328**
	(0.0198)	(0.0159)	(0.0137)	(0.0168)	(0.0143)
Age (Years)	0.00551*	-0.00831***	-0.00246	-0.00346	0.00785***
	(0.00311)	(0.00282)	(0.00235)	(0.00250)	(0.00201)
Age-squared	-0.0000617*	0.0000399	0.0000201	-0.00000421	-0.0000847***
	(0.0000339)	(0.0000302)	(0.0000257)	(0.0000258)	(0.0000215)
Education: secondary	0.0853***	0.00831	0.0235	-0.00912	0.0333**
	(0.0183)	(0.0287)	(0.0159)	(0.0234)	(0.0153)
Education: incomplete technical	0.0961**	0.135***	0.0646*	0.0486	0.0630*
	(0.0404)	(0.0451)	(0.0380)	(0.0390)	(0.0377)
Education: technical	0.242***	0.0895***	0.117***	-0.0456	0.0857***
	(0.0314)	(0.0326)	(0.0328)	(0.0418)	(0.0268)
Education: incomplete undergraduate	0.190***	0.0633	0.113***	-0.0138	0.0501**
	(0.0393)	(0.0387)	(0.0398)	(0.0355)	(0.0252)
Education: undergraduate	0.253***	0.0888**	0.191***	-0.112***	0.137***
	(0.0457)	(0.0367)	(0.0402)	(0.0398)	(0.0341)
Education: graduate	0.431***	0.178***	0.376***	-0.167**	0.258***
	(0.0480)	(0.0657)	(0.0944)	(0.0654)	(0.0621)
Married	0.0279**	-0.0164	0.0165	-0.0478**	0.0233
	(0.0136)	(0.0237)	(0.0200)	(0.0229)	(0.0146)
Single	0.0189	-0.0552**	0.00819	-0.0555***	-0.0210**
	(0.0194)	(0.0274)	(0.0206)	(0.0201)	(0.0106)
Separated/divorced	0.0235	-0.0297	0.00300	-0.00892	0.0131
	(0.0259)	(0.0306)	(0.0281)	(0.0306)	(0.0244)
Unemployed	0.141***	0.102***	0.0617***	0.0213	0.0438***
	(0.0220)	(0.0186)	(0.0177)	(0.0171)	(0.0131)
Middle class (from US\$ 401 to US\$ 1600)	0.100**	0.140**	0.161***	-0.0443	0.141***
	(0.0430)	(0.0631)	(0.0495)	(0.0356)	(0.0386)
Upper class (more than US\$ 1600)	-0.115***	-0.0922***	-0.0648***	0.00701	-0.0821***
	(0.0298)	(0.0265)	(0.0213)	(0.0353)	(0.0270)
Bolivia	0.0649**	0.138***	0.0862***	0.0440	-0.0165
	(0.0265)	(0.0360)	(0.0244)	(0.0300)	(0.0232)
Colombia	-0.0431	0.00650	-0.106	0.0876***	-0.0961***
	(0.0359)	(0.0452)	(0.0283)	(0.0339)	(0.0247)
Ecuador	0.306***	0.00844	-0.108***	0.100***	-0.235***
	(0.0337)	(0.0442)	(0.0330)	(0.0332)	(0.0229)
Constant	-0.254**	0.255**	-0.0362	0.168*	-0.102

	(0.108)	(0.110)	(0.0952)	(0.0990)	(0.0830)
Observations	4709	4709	4709	4709	4709
Hansen-j	18.54	4.172	5.122	6.249	6.520
Hansen-j (p)	0.00234	0.525	0.401	0.283	0.259
Endogeneity test (PRIDIT)	0.219	0.594	0.1150	0.2078	0.0418

Note: Two-stage feasible GMM estimates, weighted using countries' sampling weights and aggregated by total population from 18 years old in each country, and robust standard errors adjusted for 131 clusters (urban and rural by region/department). * p < 0.10, ** p < 0.05, *** p < 0.01. Hansen-j overidentification test evaluates as the null hypothesis that the set of instruments is valid, i.e., the instruments are not correlated with the error term, and therefore orthogonality conditions are satisfied. The endogeneity test shows the probability of treating PRIDIT as exogenous (Baum *et al.*, 2007).

Figure 1: Conscientiousness Index



Note: Index goes from 0 to 1. Higher scores mean that the individual tends to be more prone to plan or establish long-term goals, more scrupulous and more perseverant. The red vertical line represents the mean value (= 0.731).
