

# Policy-effective Financial Knowledge and Attitude Factors in Latin America

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December 2017

## Working Papers



# 469

ISSN 1518-3548  
CGC 00.038.166/0001-05

|                      |          |         |          |      |         |
|----------------------|----------|---------|----------|------|---------|
| Working Paper Series | Brasília | no. 469 | December | 2017 | p. 1-42 |
|----------------------|----------|---------|----------|------|---------|

# *Working Paper Series*

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## **Non-technical summary**

Financial literacy is a key element for the adequate use of financial services, which should lead to an increase in population welfare. In this paper we address two central concerns of the financial literacy literature.

The first is to use information obtained from surveys of individuals of four Latin American countries to produce measures of financial knowledge and attitude. The second is to provide guidance about which of the survey questions are associated to knowledge/attitudes on which the use of financial products depends the most. The idea is that these pieces of knowledge and attitudes could be the most effective in increasing population's welfare, which should be taken into account in the cost-benefit analysis carried on to choose those that should be the focus of dissemination efforts.

We estimate a model in which financial behavior, understood as the use of financial products and services, is explained by measures of knowledge, attitudes, and by the profile of the surveyed individuals.

We use data gathered by the Development Bank for Latin America, from Bolivia, Colombia, Ecuador and Peru. It is the first time that this technique is used in a setting with many countries. We show that the composition and the importance of variables vary from one country to another. However, the importance of attitude variables stands out in all countries, especially regarding the setting of long-term financial goals by individuals.

## **Sumário Não Técnico**

A Alfabetização Financeira é reconhecidamente um elemento chave para o uso adequado dos serviços financeiros, proporcionando um aumento de bem-estar da população. Neste artigo, abordamos duas questões centrais da literatura de alfabetização financeira.

A primeira é usar informações recolhidas utilizando entrevistas a cidadãos de vários países da América Latina para produzir indicadores de conhecimento e de atitudes financeiras. A segunda é fornecer orientação sobre quais das questões avaliadas nessas entrevistas estão associadas a conhecimentos/atitudes dos quais depende mais a utilização de produtos financeiros. A ideia é que esses conhecimentos/atitudes poderiam trazer resultados mais efetivos sobre o bem-estar da população, o que deveria ser levado em conta na análise de custo-benefício para escolher quais conhecimentos/atitudes devem ter sua disseminação como foco de esforços.

Estimamos um modelo em que o comportamento financeiro, considerado como o uso de produtos e serviços, é explicado por medidas de conhecimento, atitude e perfil dos entrevistados.

Utilizamos dados do Banco de Desenvolvimento para a América Latina, da Bolívia, Colômbia, Equador e Peru. É a primeira vez que esta técnica é usada em um contexto que inclui vários países. Mostramos que a composição e a importância do conjunto de conhecimentos e atitudes mais relevantes variam de um país para outro. No entanto, a importância das atitudes se destaca em todos os países, especialmente no que se refere à definição de metas financeiras de longo prazo por parte de indivíduos.

# Policy-effective Financial Knowledge and Attitude Factors in Latin America

Gabriel Garber\*\*

Sergio Mikio Koyama\*\*

## Abstract

In this paper we implement a technique that produces measures of financial knowledge and attitudes by combining variables with weights that capture their impact on financial behavior variables, thus providing guidance to policy design. We use data gathered by CAF-Development Bank of Latin America in Bolivia, Colombia, Ecuador, and Peru. It is the first time that this technique has been used in a cross-country setting. We show that the composition and the weight vary from one country to another. However, the importance of attitude variables stands out in all countries, especially regarding the setting of long-term goals by individuals.

**Keywords:** financial inclusion, financial literacy, financial knowledge, factors, scores  
**JEL Classification:** D83, G29, A20, D12, D14, I28

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## 1 - Introduction

The promotion of welfare enhancement through access to and adequate use of financial products by citizens is a worldwide goal. In fact, 6 out of the 17 United Nations Sustainable Development Goals to be achieved until 2030<sup>1</sup> explicitly include financial services in the list of targets they rely on. There are several supply issues in the markets that provide such services (e.g. competition and adequate product design), but, on the demand side, financial literacy<sup>2</sup> is the key element to enable the pursuit of these objectives.

The assessment of the financial literacy of a population generally relies on the use of survey instruments with sets of questions not only about financial knowledge, but also about attitudes. The emerging literature seems to have reached some degree of consensus about which are the main facets of financial literacy to be assessed. The set of questions stemming from Lusardi & Mitchell (2008) has been ubiquitously employed by researchers, governments and other stakeholders.

Once the dimensions to assess are largely agreed upon, it is natural to look for benchmarks that make possible some adequacy diagnose, aimed at producing policy recommendations. A very natural strategy for finding these benchmarks is the comparison of different populations. In 2009, a group of specialists from OECD/INFE developed the first version of a survey aimed at measuring the degree of financial education in populations of different countries. The core of the survey inquires about financial knowledge, attitudes and behavior regarding several aspects of financial education and includes questions about household budget, money management, short- and long-run financial planning, as well as financial products choice process. The initial number of 14 countries collecting this data increased to 30 in 2015, and the toolkit is consistently employed as a starting point by countries and by researchers that pursue independent data gathering.

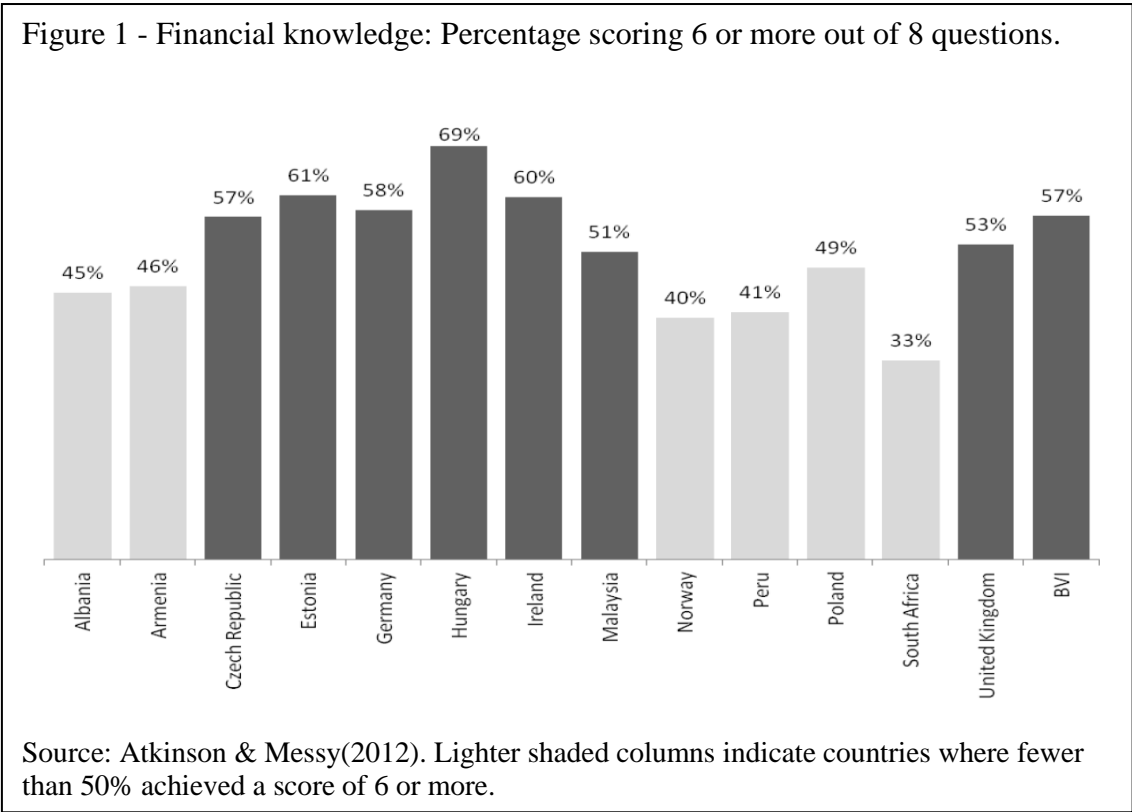
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<sup>1</sup> See <http://www.un.org/sustainabledevelopment/sustainable-development-goals/> . The goals - and targets by 2030 - that rely partially on financial services are: (1) No Poverty; (2) No Hunger; (3) Good Health and Well-Being; (5) Gender Equality; (8) Decent Work and Economic Growth; and (9) Industry.

<sup>2</sup> See Lusardi & Mitchell (2014) for definition.

Figure 1 reproduces a comparison of financial knowledge among the countries, from the first OECD data collection. The scale used there for comparison is the percentage of surveyed individuals in each country who answered correctly at least 6 of 8 questions<sup>3</sup>. This score conveys in a simple manner a comparison between countries and the readers may grasp where, among these countries, she is likely to find the gravest problems in terms of financial knowledge. Scales such as this one are widespread in the literature and have the priceless characteristics of being simple and transparent.

However, in this paper we argue for the need of a different type of scale when we



reorient our goal from making a general diagnosis to crafting policy to be applied to a specific population. When we face the problem of spending limited resources in order to enhance a population’s financial knowledge or to improve its financial attitudes, we expect this to have an impact on adequate use of financial services<sup>4</sup>, because in the end this should improve

<sup>3</sup> Actually a right answer to the compound interest rate question was only taken into account if the individual had a right answer in the (easier) simple interest rate question. We also adopt this strategy below.

<sup>4</sup> These elements also affect the economic cost of access to financial services.

welfare (for example, by the adequate use of financial products by small farmers and entrepreneurs). Thus, we develop a procedure that uses the predicted impact of financial knowledge and financial attitude variables on behavior to assign the weights that they should have in measures used for policy purposes. This is carried out using a system of equations to predict several behavioral outcomes that are regarded as important goals.

There is nothing intrinsic in the questions that causes the different pieces of knowledge assessed by the questions behind the comparison in figure 1 to have the same effect on behaviors that policymakers wish to promote. We provide evidence that it is not the case and that these effects change from country to country. Consequently, addressing policy design in the context of internationally comparable scales seems to be suboptimal usage of information and policy funding resources. The main questions may be the same, but their effects on behavior and thus welfare, vary from one country to another.

Yet, the literature that investigates the impact of financial literacy on the behavior of particular populations seems to be reluctant to forsake some simplicity in order to obtain measures that are better predictors of behavior and that could shed light on the selection of specific contents of educational interventions that could yield the highest behavioral change payoff.

In previous work, the authors implemented a new technique to address this issue, using Brazilian data gathered using the INFE-OECD toolkit and along some additional questions. Results implied that the effectiveness of variables reflecting financial knowledge in predicting policy objectives should be taken into account in the design of financial literacy programs, especially given that they are quite heterogeneous and that several variables do not seem to have an effect on financial inclusion at all.

In this study, we explore data gathered by the CAF (Development Bank for Latin America)<sup>5</sup> from four Latin American countries – Bolivia, Colombia, Ecuador and Peru - with the same technique and explore the differences and similarities among them. We find that the knowledge and attitude variables combine differently when we aim at producing factors

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<sup>5</sup> Household surveys were gathered in 2013/2014 and are representative at national level. For the dataset and full description of “*Encuesta de Medición de Capacidades Financieras en los Países Andinos*” see <http://scioteca.caf.com/handle/123456789/743>

correlated with behavior. However, there are attitude variables that stand out recurrently (i.e., in more than one country).

The paper continues as follows. In section 2, we make a brief literature review, concentrated on measures and methodological techniques. In section 3, we explain the econometric modeling we use to bring policy objectives into the computation of financial knowledge and attitudes factors. Section 4 presents the results and we conclude our study in section 5.

## **2 - Literature**

Lusardi & Mitchell (2014) provide a comprehensive survey of the literature concerning several aspects of financial literacy. Our work relates to the literature that investigates whether high financial knowledge and positive financial attitude measures predict desirable behavioral outcomes. In short, several studies show that the level of financial knowledge (measured in different ways) relates to holding precautionary savings, planning for retirement, using less costly financing and avoiding fees.

In this section, we focus on another aspect: how the literature translated responses to survey questions into measures of knowledge and attitude. In the case of financial knowledge, there are two direct ways of doing this. First, authors have used a dummy variable that takes on the value of one if the individual gets all the questions right and zero otherwise. This approach is taken, for example, in Lusardi & Mitchell (2011)<sup>6</sup>. Since this is generally applied to a short list of questions (the first three questions that appear in Lusardi & Mitchell, 2008, have become classics), which address the pillars of financial knowledge, it makes sense to give zero to anyone who is unable to get all the questions right. The main caveat is that while everyone being assigned one has the exact same answers, there is heterogeneity in the group receiving zero, which is lost by this method of measurement.

This calls for the other widely applied method of turning answer profiles into scores: giving one point for every questions properly answered. Atkinson and Messy (2012) and

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<sup>6</sup> Check Lusardi & Mitchell (2014), table 2, for a list of papers that employed this approach around the world.

Finke, Howe and Huston (2011) compute measures based on this scoring method<sup>7</sup>. This approach preserves heterogeneity and is more appealing to surveys with longer lists of questions. Thus, an individual who scored a zero could be separated from an individual who scored a nine, just short of perfect, on a ten question survey. The problem with this way of computing scores is that all questions are weighted equally. Then, the same score is attributed to everyone that gets four correct answers, no matter which subset of financial knowledge the individual displays knowledge of.

The very same body of literature provides examples of this, as we show in Table 1. These papers analyze the relationship between retirement planning and financial literacy. All of them use three questions, which assess the knowledge of interest rates, inflation and risk diversification, then compute both of these common scales and use them as explanatory variables in regressions<sup>8</sup>. Additionally, they perform the same regressions adding separate dummies for the right answer in each of the questions. Assume for a moment that you are a policymaker in one of these countries, concerned with promoting retirement planning in the population and that there is a tight budget constraint. You might be inclined to investing resources in improving knowledge related to only one of these themes. It might be that this particular population knows little about inflation and that it only takes a relatively cheap tool to address the deficiency effectively, such as a media campaign. But looking at the individual

**Table 1 – OLS Regressions of Retirement Planning on Financial Literacy Variables**

| Reference  | Alessie, van Rooij, Lusardi (2011) | Lusardi & Mitchell (2011) | Bucher-Koenen, & Lusardi (2011) | Agnew, Bateman & Thorp (2013) |
|--|------------------------------------|---------------------------|---------------------------------|-------------------------------|
| Country  | Netherlands                        | USA                       | Germany                         | Australia                     |
| Coefficients   |                                    |                           |                                 |                               |
| (1) All correct criterion  | 0.126***                           | 0.091***                  | 0.06                            | 0.123***                      |
| (2) Count of right answers criterion                             | 0.101***                           | 0.043**                   | 0.04**                          | 0.059***                      |
| (3) Separate dummies for right answers (included simultaneously) |                                    |                           |                                 |                               |
| Interest question  | 0.173***                           | 0.009                     | 0.01                            | 0.054                         |
| Inflation question   | -0.00621                           | 0.042                     | 0.04                            | -0.022                        |
| Risk diversification question                                    | 0.142***                           | 0.078**                   | 0.06                            | 0.135***                      |

Note: OLS estimates with controls. \*\*\*P<0.01, \*\*P<0.05, \*P<0.1.

<sup>7</sup> Hung, Parker & Yoong (2009) provide a table including several papers and the scales they used.

<sup>8</sup> They also perform regressions that deal with the endogeneity issue, but in this case, the whole measure is instrumented and then we do not have the coefficients of the separate questions to make this point.

question estimates could prevent what would probably be a policy mistake, since people that know relatively more about inflation do not perform better in retirement planning than the others, holding everything else constant<sup>9</sup>. Unfortunately, many papers do not present disaggregate questions coefficients.

Still, a line of reasoning could be that these question only capture a noisy signal from an inherent non-observable stock of financial literacy and, thus, the analysis of individual questions does not result in anything meaningful. However, the common measures we presented before are not fit for these analyses. Although this path has been less frequent, some studies have used factor analysis as way to group questions that are correlated, for example, Lusardi & Mitchell (2007b) and van Rooij et al (2011)<sup>10</sup>. This is useful since it avoids arbitrarily summing points and, at the same time, can indicate whether the answers result from similar or different pieces of underlying knowledge. However, this approach emphasizes commonality among variables, which could be a drawback if we are interested in behavioral outcomes, because if all variables are highly correlated (which is good as far as factor analysis is concerned), it could mean that other uncorrelated dimensions might add discriminatory and explanatory power<sup>11</sup>. Behrman et al.(2012) made an interesting progress on this issue, proposing a measure of financial knowledge based on a two-step procedure: the first step generates weights that punish more intensely the individuals who get wrong something that most of other get right, while the second uses principal components analysis to take into account correlation between questions.

We propose that it is more useful to have a measurement of financial knowledge that can combine different and potentially uncorrelated indicators of knowledge and weight them according to their coefficients in equations that predict behavior.

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<sup>9</sup> In the case of all right criterions, one could argue that the different pieces of knowledge one matter in the presence of one another. To pursue the testing of this hypothesis, one should compare the all right dummy results with those single question dummies plus their interactions.

<sup>10</sup> Huston, Finke & Smith (2012) use this approach to compute a financial sophistication proxy.

<sup>11</sup> One alternative to address this issue in line with what we propose in this paper would be to use canonical correlations to produce knowledge and attitude factors by maximizing correlation with behavior outcomes.

### 3 - Methodology

#### 3.1- Model and Econometric Implementation

In order to illustrate our approach, consider again the second column of Table 1. We argued that the sum of points through all three questions is not an adequate measure if we are to design an intervention on financial knowledge. However, the estimation with separate dummies suggests a natural indicator: give weights according to the estimated coefficients to the variables that are significant, and exclude the variables that are not. Thus, we would obtain a measure ( $I_k$ ) given by:

$$I_k = 0.173D_{\text{interest}} + 0.142D_{\text{diversification}},$$

where  $D_{\text{interest}}$  assumes value one if the interest question is answered right, and  $D_{\text{diversification}}$  is the analogous variable for risk diversification.

What we do is to transfer this interpretation to a context with several policy objectives instead of only one<sup>12</sup>. We depart from an unrestricted system with equations similar to those used in the papers referred in Table 1. In system (1), there are  $m$  equations, one for each of the financial behavior goals,  $y_i$ . The regressors are a vector of ones, a matrix of demographic controls ( $D$ ), a matrix of attitude variables ( $A$ ). In order to simplify the explanation of the technique, we show the knowledge variables,  $k_j$ , directly. The disturbances are represented by  $\varepsilon_i$ :

$$\begin{aligned} y_1 &= C_{0,1} + D\beta_{D,1} + [\beta_{k,1,1}k_1 + \beta_{k,1,2}k_2 + \beta_{k,1,3}k_3 + \dots + \beta_{k,1,J}k_J] + A\beta_{a,1} + \varepsilon_1 \\ y_2 &= C_{0,2} + D\beta_{D,2} + [\beta_{k,2,1}k_1 + \beta_{k,2,2}k_2 + \beta_{k,2,3}k_3 + \dots + \beta_{k,2,J}k_J] + A\beta_{a,2} + \varepsilon_2 \quad (1) \\ &\vdots \\ y_m &= C_{0,m} + D\beta_{D,m} + [\beta_{k,m,1}k_1 + \beta_{k,m,2}k_2 + \beta_{k,m,3}k_3 + \dots + \beta_{k,m,J}k_J] + A\beta_{a,m} + \varepsilon_m \end{aligned}$$

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<sup>12</sup> In Garber and Koyama (2016), we show that the technique used in the present study can be viewed as a way to simplify the policymakers' decision making process by rendering the subjective weight attributed to different financial inclusion policy goals irrelevant. As a result, all efforts can be directed to a simple cost-benefit analysis of the different contents that could be a focus of financial literacy programs and interventions.

This would result in a different  $I_k$  index for each outcome  $y_i$ . In order to obtain only one weight for each of the variables considered, we need to impose restrictions on the estimation. The ideal result would be a system like (2), in which we have, in the brackets, the same linear combination of the knowledge variables in all equations, with an unrestricted coefficient multiplying it in each one of them<sup>13</sup>. We call this linear combination a policy-effective knowledge factor.

$$\begin{aligned}
y_1 &= C_{0,1} + D\beta_{D,1} + g_1[f_1k_1 + f_2k_2 + f_3k_3 + \dots + f_jk_j] + A\beta_{a,1} + \varepsilon_1 \\
y_2 &= C_{0,2} + D\beta_{D,2} + g_2[f_1k_1 + f_2k_2 + f_3k_3 + \dots + f_jk_j] + A\beta_{a,2} + \varepsilon_2 \quad (2) \\
&\vdots \\
y_m &= C_{0,m} + D\beta_{D,m} + g_m[f_1k_1 + f_2k_2 + f_3k_3 + \dots + f_jk_j] + A\beta_{a,m} + \varepsilon_m
\end{aligned}$$

The drawback of substituting (2) for (1) is that some of the many restrictions implied by (2) might be rejected by the data. In order to test them explicitly, we use an iterative procedure to specify the model that is as close as possible to (2), without the imposition of restrictions that are rejected. We start by estimating a system including only controls and search for the knowledge variables that would be significant in the largest possible set of equations. Then we test if the coefficients of these variables are proportional along equations<sup>14</sup>, which allow us to define a factor. The inclusion of other knowledge variables in this factor is tested subsequently, until there are no variables left which could be included in the factor and would have a significant coefficient if included in it. We allow the specification of more than one factor and, after considering all the knowledge variables, we start the process with attitude variables.

We estimate the system using nonlinear seemingly unrelated regressions (NLSUR), with robust standard errors. The testing and imposition of restrictions in the estimation make necessary the simultaneous estimation of the system, thus there is no reason not to explore efficiency gains. Although we nest our approach in a linear probability model, a nonlinear

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<sup>13</sup> Identification requires fixing one of these coefficients.

<sup>14</sup> i.e.  $H_0: \beta_{k,1,1}/\beta_{k,2,1} = \beta_{k,1,2}/\beta_{k,2,2} , \dots , \beta_{k,1,1}/\beta_{k,m,1} = \beta_{k,1,2}/\beta_{k,m,2}$

estimator is necessary to obtain the factors, since there is coefficient multiplication. This allows us to directly implement Wald restriction tests to verify if the coefficients of a knowledge (or attitude) variable are proportional to the coefficients of another variable along the equations of the system.

There is no theoretical reason for choosing a linear probability structure instead of a logit one. Both structures are widely used in financial literacy applications. However, the linear probability model requires less computational resources and allows the instrumentation by three-stage least squares, instead of requiring a bootstrap to deal with the generated regressors problem, as implemented in Garber & Koyama (2016).

Therefore, the results we present in Section 4 can be divided into two groups, one containing the list of variables that can be grouped into a policy-effective factor along with their coefficients (corresponding to the  $f_j$  in system 2), and the other being the list of target variables that they affect along with the coefficients that measure these impacts (the  $g_i$ ).

### **3.2 – Variables**

In this subsection, we present the variables from the dataset used as dependent (policy targets), control, knowledge and attitude variables.

The dependent variables for each equation are shown in Table 2. In order to choose the behaviors that we could employ as dependent variables, we required that, when considering all four countries together, at least a certain amount of individuals exhibited that behavior. We lowered this threshold to 4% in order to have 12 equations. The least frequent behavior we included is borrowing from loan sharks.

Table 2 – Dependent variables

| Variable           | Description   | % Obs |
|--------------------|---|-------|
| Saving_12m         | The individual has saved in the preceding 12 months   | 59    |
| Saving_12m_fin     | The individual has saved in the preceding 12 months in the financial sector. It includes: <ul style="list-style-type: none"> <li>• Purchase of financial investment products other than pension funds.</li> <li>• Leaving some money in the savings or checking account.</li> <li>• Making deposits in a checking account or a term deposit.</li> <li>• Frequently depositing money in a savings account</li> </ul> | 28    |
| Prepared           | If the individual lost his main income, he could cover his expenditure for at least three months.   | 17    |
| Budget             | Has a budget  | 56    |
| Exact_Budget       | Has an exact budget   | 18    |
| Binding_Budget     | Has a budget and always follows it  | 30    |
| Comparison         | In his last choice of a financial product, he compared various options (either from different financial institutions or within one)   | 43    |
| Check_Account      | Has a checking account  | 9     |
| Savings_Account    | Has a savings account   | 34    |
| Loan_shark         | Owes money to a loan shark  | 4     |
| Credit_card        | Has a credit card   | 34    |
| Consumption_credit | Has a consumption loan, including vehicles (some heterogeneity between countries)   | 23    |

The controls included in  $D$  are shown in Table 3. Since there are several controls and many of them are not statistically significant in some equations, we exclude these from those equations. The reason for this is twofold. First off, it makes the nonlinear SUR computationally lighter by reducing the equation, and secondly, it produces some variables that may be used as instruments. Given that endogeneity in our equations is a major concern, after the knowledge and attitude factors are defined, we re-estimate the system using three-stage least squares (3SLS) and the full set of controls as instruments. Although these are not variables specifically designed to work as instruments, the excluded ones allow identification of the coefficients. Also, these variables are accepted as exogenous by most researchers, given that they are frequently used as controls. In these estimations, all factors along with other knowledge and attitude variables that enter the equations are regarded as endogenous. In an additional estimation, we allow the instrumented factors to enter all the equations since

we wish to check whether the documented<sup>15</sup> downward bias in these estimations rendered the coefficients not significant in some equations. Thus, when we present the results corresponding to the  $g_i$  in system (2), we show three estimates: the first one endogenous, the second instrumenting the endogenous specification, and the third allowing instrumented factors to enter all equations.

| Variable              | Description  |
|-----------------------|--|
| Insufficient income   | Dummy indicating individuals whose income has been insufficient to cover expenditure at least once in the previous 12 months |
| Social program        | Dummy indicating individuals who participate in some social program  |
| Stable income         | Dummy indicating individuals who consider their income stable  |
| Male                  | Dummy indicating males   |
| Age, Age^2            | Age and squared age  |
| Education             | 12 dummies for educational level   |
| Children number       | Number of children in the household  |
| Children presence     | Dummy indicating the presence of at least one child in the household   |
| Adult number          | Number of other adults in the household  |
| Adult presence        | Dummy indicating the presence of other adults in the household   |
| Marital status        | 7 marital status dummies   |
| Socioeconomic Level   | A set of socioeconomic level dummies for each country  |
| Income level          | A set of income level dummies for each country   |
| Employment status     | 12 employment status dummies   |
| Community description | 4 dummies: Rural, Small urban, Medium urban, Large urban.  |

Table 4 presents the financial knowledge questions in the survey and the names we assign them for easier reference. We convert the answers in variables by assigning 1 to if the answer is right and 0 otherwise, including the cases with no answer. Although we acknowledge that the answer “I do not know” is different from a wrong one, it is complex to interpret what this difference means in term of policy (i.e. we should know more about the effect of improving confidence on taking the wrong decisions instead of avoiding choice).

<sup>15</sup> See Garber and Koyama (2016) for a brief review on the topic.

| Variable                         | Question   |
|----------------------------------|--|
| Division                         | Imagine that five brothers are given a gift of \$1,000. If the brothers have to share the money equally how much does each one get?  |
| Inflation in practice            | Now imagine that the brothers have to wait for one year to get their share of the \$1,000 and inflation stays at X percent. In one year's time will they be able to buy: (4 alternatives)  |
| Interest definition              | You lend \$20 to a friend one evening and he gives you \$20 back the next day. Has he paid any interests on this loan? (Yes/No)  |
| Simple interest                  | Suppose you put \$100 into a savings account with a guaranteed interest rate of 2% per year. You don't make any further payments into this account and you don't withdraw any money. How much would be in the account at the end of the first year, once the interest payment is made? |
| Compound interest – double right | And how much would be in the account at the end of five years? (4 alternatives, only considered right if the previous question was right)  |
| Risk and return                  | An investment with a high return is likely to be high risk. (True/False)   |
| Inflation Definition             | High inflation means that the cost of living is increasing rapidly. (True/False)   |
| Diversification                  | It is less likely that you will lose all your money if you invest it in more than one place. (True/False)  |

| Variable                 | Statement  |
|--------------------------|--|
| Conscientious consumer   | Before I buy something I carefully consider whether I can afford it.                         |
| <i>Carpe diem</i> (inv.) | I tend to live for today and let tomorrow take care of itself. (inverted scale)              |
| Impatient(inv.)          | I find it more satisfying to spend money than to save it for the long term. (inverted scale) |
| Responsible              | I pay my bills on time   |
| Bold                     | I am prepared to risk some of my own money when saving or making an investment.              |
| Conscientious at finance | I keep a close personal watch on my financial affairs.                                       |
| Planner                  | I set long-term financial goals and strive to achieve them.                                  |
| Spender (inv.)           | Money is there to be spent. (inverted scale)   |

The attitude variables are built on a question with eight statements. The surveyed individuals are asked to say how much they agree with them, on a scale that goes from 1 (completely disagree) to 5 (completely agree). The variables were computed as increasing from 1 (most undesirable answer) to 5 (most desirable answer). In order to make all the variables increase with desirability of the answer, some of the original scales had to be inverted. Table 5 shows the statements and indicates which ones were inverted.

## 4 - Results

In this section we present the results of the country level factor specification and estimation. The weights of the variables included in each factor should be understood as relative weights, since their levels depend on the equation that is chosen to fix the factor coefficient as a unit, for normalization and identification. After the estimation, all factors were standardized to be representable in a scale ranging from 0 to 100. For this standardization the theoretical (not necessarily equal to the observed) minimum and maximum values of the factors were used to center a rescale values.

As we show below, in two countries (Peru and Bolivia) the methodology combined variables into factors that seem to capture most of the impact of financial knowledge and especially of financial attitudes on financial behaviors. In Ecuador and Colombia, only a factor of attitudes combining two variables was found and it was significant in a smaller number of equations. This does not invalidate the analysis, since it reflects characteristics of the different populations. It indicates, however, that policymakers in these countries will not have available a single factor which affects several behavior variables simultaneously, as far as our technique is concerned. Thus, these policymakers face the problem of defining which financial behavior variables are the most important ones when they design interventions.

For all the countries, we analyze how the factors found vary along observable characteristics. However, we should point out that for Ecuador and Colombia this analysis is less important, since most of the information about attitudes could not be incorporated into them. In the conclusion of this section, we comment on regular patterns found among countries.

## 4.1 - Peru

In the Peruvian dataset, the technique resulted in the specification of only one attitude factor. The included variables and their weights are displayed in Table 6.

| Variable                 | Weight   |
|--------------------------|----------|
| bold                     | 0.006**  |
| conscientious at finance | 0.041*** |
| planner                  | 0.008**  |

\*\*\* p-value<1%, \*\* p-value<5%

The Peruvian financial attitude factor computed is significant in the equations that explain several financial behavior outcomes, as can be seen in in the second and third columns of Table 7.

| Equation           | NLSUR       | NLSUR   | 3SLS            | 3SLS    | 3SLS-all    | 3SLS-all |
|--------------------|-------------|---------|-----------------|---------|-------------|----------|
|                    | Coefficient | P-value | Coefficien<br>t | P-value | Coefficient | P-value  |
| Saving_12m         | 1 (fixed)   |         | 3.382           | <0.001  | 3.626       | 0.000    |
| Saving_12m_fin     | 0.455       | 0.013   | 2.009           | 0.008   | 2.364       | 0.002    |
| Prepared           | -           |         | -               |         | 1.672       | 0.033    |
| Budget             | 0.735       | 0.012   | 2.139           | 0.009   | 2.397       | 0.004    |
| Exact_Budget       | -           |         | -               |         | 0.376       | 0.003    |
| Binding_Budget     | 0.736       | 0.001   | 2.088           | 0.000   | 2.133       | 0.000    |
| Comparison         | 0.793       | 0.001   | 0.692           | 0.162   | 0.812       | 0.103    |
| Check_Account      | -           |         | -               |         | 0.902       | 0.045    |
| Savings_Account    | -           |         | -               |         | 0.499       | 0.474    |
| Loan_shark         | -0.291      | 0.049   | 0.028           | 0.562   | 0.025       | 0.611    |
| Credit_card        | 0.573       | 0.002   | 0.524           | 0.028   | 0.551       | 0.021    |
| Consumption_credit | -           | -       |                 |         | 0.154       | 0.811    |

First stage:  $F(52, 964) = 3.02$ , Prob > F = 0.0000

With this estimation, the factor may be computed for each individual in the sample. We analyze how this factor varies with the sampled individuals' characteristics. It generally increases with the education level, although this is not true for the two lowest levels, for which we have a very small sample. It also seems to increase with social class. In terms of

gender, the factor is on average higher for males. Finally, the factor exhibits a mild usual inverted U-shape along age. These features may be inspected in Graph A1 in Annex A.

Going back to Table 7, in the fourth and fifth columns we display the results of the three stages least squares estimation. Some interesting features arise. As expected, the comparison of columns one and three indicated downward bias estimation for most of the coefficients. Unfortunately, the three-stage least squares estimation loses precision in the coefficient of the loan sharks equation and on the comparison equations, rendering the coefficient not significant. Analyzing the last two columns, which consider the inclusion of the instrumented factor in all equations, it seems that this downward bias resulted in the exclusion of the attitude factor from some equations in the NLSUR specification: the instrumented regression indicates a positive and significant coefficient in three extra equations.

In Table 8, we show the p-value of the coefficients of knowledge and attitude variables that do not belong in factors, but are significant at the 10% level in some equations. None of them seems to affect many variables, except for simple interest. Taking as a reference the 3SLS estimation with the inclusion of the instrumented factor in all equations, the attitude factor found is significant in eight equations, thus affecting most of the financial behavior variables. This makes the attitudes pertinent to the questions in Table 6 particularly interesting for interventions. Furthermore, although the costs of addressing these topics should be assessed, in terms of the benefits, the improvement of being conscientious at finance stands out from the other two attitudes in the factor: the coefficient is more than five times as large as those of the other variables.

Table 8 – Peru – P-values of knowledge and attitude variables not included in factors

|                                  | Saving_12m<br>1 | Saving_12m_fin<br>2 | Prepared<br>3 | Budget<br>4 | Exact_Budget<br>5 | Binding_Budget<br>6 | Comparison<br>7 | Check_Account<br>8 | Savings_Account<br>9 | Loan_shark<br>10 | Credit_card<br>11 | Consumption_credit<br>12 |
|----------------------------------|-----------------|---------------------|---------------|-------------|-------------------|---------------------|-----------------|--------------------|----------------------|------------------|-------------------|--------------------------|
| Division                         | 0.041           |                     |               |             |                   |                     |                 |                    |                      |                  |                   | 0                        |
| Inflation in practice            | 0.051           |                     |               |             |                   |                     |                 |                    |                      | 0.01             |                   |                          |
| Interest definition              | 0.092           |                     |               |             |                   |                     |                 |                    |                      |                  |                   |                          |
| Simple interest                  | 0.018           | 0.001               |               | 0.061       |                   | 0.017               |                 |                    |                      |                  |                   |                          |
| Compound interest – double right | 0.031           |                     |               |             |                   |                     |                 | 0.004              |                      |                  |                   |                          |
| Risk and return                  | 0.016           |                     |               |             |                   |                     |                 |                    |                      |                  |                   |                          |
| Inflation Definition             | 0.033           |                     |               |             |                   |                     |                 |                    |                      |                  |                   |                          |
| Diversification                  | 0.019           |                     |               |             |                   |                     |                 |                    |                      |                  |                   |                          |
| Conscientious consumer           | 0.089           |                     |               |             |                   |                     |                 |                    |                      |                  |                   |                          |
| <i>Carpe diem</i> (inv.)         | 0.048           |                     |               |             |                   |                     |                 |                    | 0.061                |                  |                   |                          |
| Impatient(inv.)                  | 0.002           |                     |               |             |                   |                     |                 |                    |                      |                  |                   |                          |
| Responsible                      |                 |                     |               |             |                   |                     |                 |                    |                      |                  |                   |                          |
| Bold                             |                 |                     |               |             |                   |                     |                 |                    |                      |                  |                   |                          |
| Conscientious at finance         |                 |                     |               |             |                   |                     |                 |                    |                      |                  |                   |                          |
| Planner                          |                 |                     |               |             |                   |                     |                 |                    |                      |                  |                   |                          |
| Spender (inv.)                   | 0.024           |                     |               |             |                   | 0.044               |                 |                    |                      |                  | 0.049             |                          |

Shaded variables enter the factor

## 4.2 - Bolivia

In the Bolivian dataset, it was not possible to estimate the equation for personal credit. Two factors were found, one for knowledge and another for attitudes. The variables included in the knowledge factor and their weights are displayed in Table 9.

Variables compound interest (double right) and inflation definition have a higher estimated weight and are more statistically significant than the others. The estimated knowledge factor coefficients in the behavior equations are shown in the second and third columns of Table 10.

| Variable                         | Weight  |
|----------------------------------|---------|
| Division                         | 0.029*  |
| Compound interest – double right | 0.057** |
| Risk and return                  | 0.027*  |
| Inflation definition             | 0.042** |

\*\*\* p-value<1%,\*\* p-value<5%,\* p-value<10%

| Equation        | NLSUR<br>Coeff. | NLSUR P-<br>value | 3SLS<br>Coeff. | 3SLS<br>P-value | 3SLS-all<br>Coeff. | 3SLS-all<br>P-value |
|-----------------|-----------------|-------------------|----------------|-----------------|--------------------|---------------------|
| Saving_12m      | 0.989           | 0.035             | 2.959          | 0.054           | 3.393              | 0.028               |
| Saving_12m_fin  | 1 (fixed)       |                   | 1.641          | 0.472           | 2.562              | 0.270               |
| Prepared        | -               |                   | -              |                 | 2.736              | 0.065               |
| Budget          | 2.881           | 0.021             | 3.071          | 0.049           | 3.341              | 0.033               |
| Exact_Budget    | 1.680           | 0.027             | 2.551          | 0.052           | 2.423              | 0.066               |
| Binding_Budget  | 1.766           | 0.029             | 2.626          | 0.095           | 2.788              | 0.077               |
| Comparison      | -               |                   | -              |                 | 2.712              | 0.182               |
| Check_Account   | -               |                   | -              |                 | 1.656              | 0.201               |
| Savings_Account | 0.726           | 0.059             | -0.866         | 0.696           | 0.035              | 0.988               |
| Loan_shark      | -               |                   | -              |                 | 0.199              | 0.623               |
| Credit_card     | -               |                   | -              |                 | 1.798              | 0.272               |

First Stage:F( 49, 1056) = 4.05, Prob > F = 0.0000

The Bolivian financial knowledge factor increases with social class and formal education (except at the lowest level). It is slightly higher for men than women. In terms of age, the factor displays a weak inverted U-shape, peaking at the 25-34 age group. These features may be further explored in Graph A2 in Annex A.

Still in Table 10, the fourth and fifth columns show the instrumented version of the system. Although the knowledge factor ceases being significant in two equations, in all of the others it shows the underestimation bias of the endogenous version. The exercise of

including the instrumented factor in all the equations (sixth and seventh columns of Table 7) largely confirms the original specification, although the results indicate that the elimination of the downward bias results in the factor becoming significant in the equation of preparedness for negative shocks.

The variables and weights in the Bolivian financial attitude factor are shown in Table 11, while the estimated attitude factor coefficients in the behavior equations are shown in Table 12, where we show that it was significant in 8 equations plus the fixed coefficient.

| Variable    | Weight   |
|-------------|----------|
| Responsible | 0.030*** |
| Bold        | 0.013*   |
| Planner     | 0.031*** |

\*\*\* p-value<1%,\*\* p-value<5%,\* p-value<10%

| Equation        | NLSUR Coefficient | NLSUR P-value | 3SLS Coefficient | 3SLS P-value | 3SLS-all Coefficient | 3SLS-all P-value |
|-----------------|-------------------|---------------|------------------|--------------|----------------------|------------------|
| Saving_12m      | 0.906             | 0.002         | 0.930            | 0.293        | 0.794                | 0.371            |
| Saving_12m_fin  | 0.844             | 0.002         | 1.797            | 0.055        | 1.547                | 0.104            |
| Prepared        | 0.445             | 0.029         | 1.407            | 0.095        | 0.674                | 0.469            |
| Budget          | 0.732             | <0.001        | 1.693            | 0.054        | 1.603                | 0.068            |
| Exact_Budget    | 0.393             | 0.019         | 0.590            | 0.433        | 0.591                | 0.433            |
| Binding_Budget  | 1(fixed)          |               | 1.669            | 0.095        | 1.594                | 0.112            |
| Comparison      | 0.550             | 0.019         | 2.017            | 0.008        | 1.389                | 0.126            |
| Check_Account   | 0.275             | 0.081         | 0.801            | 0.152        | 0.413                | 0.525            |
| Savings_Account | 0.744             | 0.006         | 2.591            | 0.005        | 2.367                | 0.013            |
| Loan_shark      | -                 |               | -                |              | 0.074                | 0.771            |
| Credit_card     | -                 |               | -                |              | 0.050                | 0.946            |

First Stage:  $F(49, 1056) = 3.04, \text{Prob} > F = 0.0000$

The attitude factor in Bolivia increases with social class as well as with formal education. The difference between men and women is very small, with a slightly smaller average for the latter. The behavior of this factor by age group resembles the one of the knowledge factor: weak inverted U, peaking at 25 to 34 years old. These details can be further inspected in Graph A3, in Annex A.

Considering the instrumented versions of the system, the fourth and fifth columns of Table 12, once more, confirm the presence of underestimation bias in the NLSUR specification. The loss of precision renders the factor not statistically significant in three equations. Including the factor in all the equations does not result in it being significant in any additional equation, as reflected in the sixth and seventh columns.

|                                   | Saving_12m<br>1 | Saving_12m_fin<br>2 | Prepared<br>3 | Budget<br>4 | Exact_Budget<br>5 | Binding_Budget<br>6 | Comparison<br>7 | Check_Account<br>8 | Savings_Account<br>9 | Loan_shark<br>10 | Credit_card<br>11 |
|-----------------------------------|-----------------|---------------------|---------------|-------------|-------------------|---------------------|-----------------|--------------------|----------------------|------------------|-------------------|
| Division                          |                 |                     |               |             |                   |                     |                 |                    |                      |                  |                   |
| Inflation in practice             |                 | 0.025               | <0.001        |             | 0.010             |                     |                 |                    |                      |                  |                   |
| Interest definition               |                 |                     |               |             |                   |                     |                 |                    |                      |                  |                   |
| Simple interest                   |                 | <0.001              |               |             |                   |                     |                 |                    | 0.028                |                  |                   |
| Compound interest – double right  |                 |                     |               |             |                   |                     |                 |                    |                      |                  |                   |
| Risk and return                   |                 |                     |               |             |                   |                     |                 |                    |                      |                  |                   |
| Inflation Definition              |                 |                     |               |             |                   |                     |                 |                    |                      |                  |                   |
| Diversification                   |                 |                     |               |             |                   |                     |                 | 0.008              |                      |                  | 0.050             |
| Conscientious consumer            |                 |                     |               |             |                   | 0.081               |                 |                    |                      |                  | 0.008             |
| <i>Carpe diem</i> (inv.)          |                 |                     |               |             |                   |                     |                 |                    |                      |                  |                   |
| Impatient(inv.)                   |                 |                     |               |             |                   |                     |                 |                    |                      |                  | 0.029             |
| Responsible                       |                 |                     |               |             |                   |                     |                 |                    |                      |                  |                   |
| Bold                              |                 |                     |               |             |                   |                     |                 |                    |                      |                  |                   |
| Conscientious at finance          |                 |                     |               |             |                   |                     |                 |                    |                      |                  |                   |
| Planner                           |                 |                     |               |             |                   |                     |                 |                    |                      |                  |                   |
| Spender (inv.)                    |                 |                     |               |             |                   |                     |                 |                    |                      |                  |                   |
| Shaded variables enter the factor |                 |                     |               |             |                   |                     |                 |                    |                      |                  |                   |

In Table 13, we show the of coefficient p-values of knowledge and attitude variables that do not belong in the factors, but are significant at the 10% level in some equations. The association appears to be scattered. This indicates that most of the effect of financial knowledge and attitude variables on financial behavior variables is captured by the factors. In the knowledge factor, the compound interest question is the one with the highest point estimate, followed by the understanding of inflation as changing prices. The attitude factor indicates that increasing the self-assessment of paying bills on time and of setting long-term goals show an advantage in term of policy benefits over promoting the attitude of being prepared to take risks in investments.

**4.3 - Ecuador**

In the Ecuadorian dataset only an attitude factor with two variables was found. These variables can be seen in Table 14.

| Table 14 – Ecuador – Attitude Factor |          |
|--------------------------------------|----------|
| Variable                             | Weight   |
| Responsible                          | 0.019*** |
| Planner                              | 0.054*** |

\*\*\* p-value<1%,\*\* p-value<5%,\* p-value<10%

In the second and third columns of Table 15, we show in which equations the factor was significant along with the coefficients of the endogenous version.

The attitude factor in Ecuador tends to increase with social class for almost all classes, but its increase with formal education is questionable. With regard to age, the factor decreases from 44 years old onwards. The difference between genders is very small, with men slightly ahead. These outcomes may be analyzed in Graph A4, in Annex A.

| Table 15 – Ecuador – Attitude Factor |                      |                  |                     |                 |                         |                     |
|--------------------------------------|----------------------|------------------|---------------------|-----------------|-------------------------|---------------------|
| Equation                             | NLSUR<br>Coefficient | NLSUR<br>P-value | 3SLS<br>Coefficient | 3SLS<br>P-value | 3SLS-all<br>Coefficient | 3SLS-all<br>P-value |
| Ahorro_12m                           | 1(fixed)             |                  | -0.638              | 0.529           | -0.584                  | 0.565               |
| Ahorro_12m_fin                       | 0.912                | <0.001           | 0.861               | 0.437           | 1.010                   | 0.364               |
| Preparado                            | -                    |                  | -                   |                 | -0.148                  | 0.775               |
| T_presup                             | 0.666                | 0.004            | 0.317               | 0.673           | 0.266                   | 0.730               |
| T_presup_e                           | -                    |                  | -                   |                 | -0.185                  | 0.716               |
| T_presup_s                           | 0.547                | 0.006            | -0.262              | 0.658           | -0.335                  | 0.585               |
| El_comp                              | 1.119                | <0.001           | 1.573               | 0.002           | 1.686                   | 0.001               |
| T_ccorriente                         | -                    |                  | -                   |                 | 0.404                   | 0.250               |
| T_cahorro                            | 0.442                | 0.045            | 0.987               | 0.240           | 1.078                   | 0.202               |
| T_prestamistas                       | 0.161                | 0.047            | 0.634               | 0.031           | 0.621                   | 0.035               |
| T_tarjcred                           | -                    |                  | -                   |                 | 0.565                   | 0.19                |
| T_credcons                           | -                    |                  | -                   |                 | 0.177                   | 0.651               |

First stage:  $F(52, 1118) = 3.44, \text{Prob} > F = 0.0000$

The instrumented versions of the system are more imprecise (columns three through six of Table 15). This is likely to result from correlations between the instruments and the factor. Only in two equations do they retain significance. In these, the coefficient, once more, indicates underestimation bias in the NLSUR specification. The exercise of including the instrumented factor in all equations does not result in significance in any additional equation.

Table 16 – Ecuador – P-values of knowledge and attitude variables not included in factors

|                                  | 1<br>Saving_12m | 2<br>Saving_12m_fin | 3<br>Prepared | 4<br>Budget | 5<br>Exact_Budget | 6<br>Binding_Budget | 7<br>Comparison | 8<br>Check_Account | 9<br>Savings_Account | 10<br>Loan_shark | 11<br>Credit_card | 12<br>Consumption_credit |
|----------------------------------|-----------------|---------------------|---------------|-------------|-------------------|---------------------|-----------------|--------------------|----------------------|------------------|-------------------|--------------------------|
| Division                         | 0.097           | 0.043               |               | 0.035       |                   | 0.056               | 0.024           | 0.005              |                      |                  |                   | 0.097                    |
| Inflation in practice            | <0.001          | <0.001              |               |             |                   |                     |                 |                    |                      | 0.023            |                   | 0.000                    |
| Interest definition              | 0.039           |                     |               |             | 0.007             |                     |                 |                    |                      |                  |                   | 0.039                    |
| Simple interest                  | 0.031           | 0.026               |               |             |                   |                     |                 |                    | <0.001               |                  |                   | 0.031                    |
| Compound interest – double right |                 |                     |               |             |                   |                     |                 |                    |                      | 0.057            | 0.026             |                          |
| Risk and return                  |                 |                     | 0.072         |             | 0.094             |                     | 0.016           |                    |                      |                  |                   |                          |
| Inflation Definition             | <0.001          | 0.023               | 0.056         |             |                   |                     |                 |                    |                      |                  |                   | <0.001                   |
| Diversification                  |                 |                     |               |             |                   |                     |                 |                    | 0.019                |                  | 0.098             |                          |
| Conscientious consumer           |                 | 0.009               |               |             |                   |                     |                 |                    | 0.077                |                  |                   |                          |
| <i>Carpe diem</i> (inv.)         |                 |                     |               |             |                   | 0.013               |                 |                    |                      |                  |                   |                          |
| Impatient(inv.)                  |                 |                     | 0.077         | 0.001       | 0.089             | 0.024               |                 |                    |                      |                  |                   |                          |
| Responsible                      |                 |                     |               |             |                   |                     |                 |                    |                      |                  |                   |                          |
| Bold                             | 0.083           |                     |               | 0.056       |                   |                     |                 |                    |                      |                  |                   | 0.083                    |
| Conscientious at finance         |                 |                     | <0.001        | 0.052       |                   |                     |                 |                    | 0.061                |                  |                   |                          |
| Planner                          |                 |                     |               |             |                   |                     |                 |                    |                      |                  |                   |                          |
| Spender (inv.)                   | 0.003           | 0.009               | 0.031         |             | 0.094             |                     |                 |                    |                      |                  | 0.032             | 0.003                    |

Shaded variables enter the factor

In Table 16, we show the attitude and knowledge variables that were significant even though they did not participate in a factor. Several variables are correlated with the behavior variables, but as their coefficients are not “proportional” along the equations, most of them cannot be included in factors, making the policy design more complex.

#### 4.4 - Colombia

In the Colombian dataset only an attitude factor with two variables was found. These variables are presented in Table 17.

| Variable                 | Weight   |
|--------------------------|----------|
| Impatient(inv.)          | 0.030*** |
| Conscientious at finance | 0.010**  |

\*\*\* p-value<1%, \*\* p-value<5%, \* p-value<10%

In Table 18, we show in which equations the factor was significant along with its coefficients.

| Equation           | NLSUR       | NLSUR   | 3SLS        | 3SLS    | 3SLS-all    | 3SLS-all |
|--------------------|-------------|---------|-------------|---------|-------------|----------|
|                    | Coefficient | P-value | Coefficient | P-value | Coefficient | P-value  |
| Saving_12m         | 1(fixed)    |         | 2.048324    | 0.126   | 2.278       | 0.092    |
| Saving_12m_fin     | 0.476       | 0.049   | 1.035       | 0.480   | 1.520       | 0.321    |
| Prepared           | -           |         | -           |         | 0.974       | 0.424    |
| Budget             | 0.533       | 0.073   | -0.225      | 0.864   | 1.53        | 0.311    |
| Exact_Budget       | -           |         | -           |         | 0.356       | 0.796    |
| Binding_Budget     | -           |         | -           |         | 3.821       | 0.013    |
| Comparison         | -           |         | -           |         | -0.816      | 0.518    |
| Check_Account      | -           |         | -           |         | 1.692       | 0.058    |
| Savings_Account    | -           |         | -           |         | 1.472       | 0.355    |
| Loan_shark         | -           |         | -           |         | -0.285      | 0.724    |
| Credit_card        | -           |         | -           |         | 1.147       | 0.323    |
| Consumption_credit | -0.371      | 0.087   | -0.084      | 0.907   | 0.045       | 0.950    |

First Stage:  $F(52, 1145) = 1.55$ , Prob > F = 0.0083

The attitude factor in Colombia increases with social class for almost all classes, but its increase with formal education appears weak. In terms of age, the factor decreases from 44 years old onwards. The difference between genders places women ahead of men, on average. These features may be inspected in Graph A5, in Annex A.

Table 19 – Colombia – P-values of knowledge and attitude variables not included in factors

|                                  | 1<br>Saving_12m | 2<br>Saving_12m_fin | 3<br>Prepared | 4<br>Budget | 5<br>Exact_Budget | 6<br>Binding_Budget | 7<br>Comparison | 8<br>Check_Account | 9<br>Savings_Account | 10<br>Loan_shark | 11<br>Credit_card | 12<br>Consumption_credit |
|----------------------------------|-----------------|---------------------|---------------|-------------|-------------------|---------------------|-----------------|--------------------|----------------------|------------------|-------------------|--------------------------|
| Division                         |                 |                     |               | 0.003       |                   | 0.007               |                 |                    | 0.047                |                  | 0.005             |                          |
| Inflation in practice            |                 | 0.041               |               |             |                   |                     | 0.035           |                    |                      |                  |                   |                          |
| Interest definition              |                 |                     |               |             |                   |                     |                 |                    |                      |                  |                   |                          |
| Simple interest                  |                 |                     |               |             |                   |                     | 0.023           |                    |                      |                  |                   |                          |
| Compound interest – double right | 0.016           |                     |               |             |                   |                     |                 |                    |                      |                  | 0.039             | 0.016                    |
| Risk and return                  |                 |                     | 0.066         |             |                   |                     |                 |                    |                      |                  |                   |                          |
| Inflation Definition             |                 |                     |               | 0.041       |                   |                     |                 |                    | 0.081                |                  |                   |                          |
| Diversification                  |                 |                     |               |             |                   |                     |                 |                    |                      |                  |                   |                          |
| Conscientious consumer           |                 |                     |               | 0.000       | 0.005             | 0.001               |                 |                    |                      |                  |                   |                          |
| <i>Carpe diem</i> (inv.)         |                 |                     |               |             |                   |                     |                 |                    |                      |                  |                   |                          |
| Impatient(inv.)                  |                 |                     |               |             |                   |                     |                 |                    |                      |                  |                   |                          |
| Responsible                      |                 | 0.028               |               |             |                   |                     |                 |                    |                      | 0.037            |                   |                          |
| Bold                             |                 |                     |               | 0.017       |                   |                     |                 |                    |                      |                  |                   |                          |
| Conscientious at finance         |                 |                     |               |             |                   |                     |                 |                    |                      |                  |                   |                          |
| Planner                          | <0.001          |                     | 0.035         |             |                   |                     |                 | 0.066              |                      | 0.001            |                   | 0.000                    |
| Spender (inv.)                   |                 |                     |               |             | 0.028             |                     |                 |                    | 0.051                |                  |                   |                          |

Shaded variables enter the factor

The instrumented estimation of the system, shown in columns three and four render the coefficients not significant in all equations. The inclusion of the factor in all equations, displayed in the last two columns of Table 18 results in three significant coefficients at the 10% level. Two of them do not belong in the NLSUR specification, indicating some presence of downward bias in it.

In Table 19, we show the attitude and knowledge variables that were significant even though they did not participate in a factor. As in the Ecuadorian case, many variables are correlated with financial behavior and most of them cannot be included in the factors, making the policy design more complex.

#### **4.5 – Cross-country comparisons**

Although in this paper we focus on policy design and, thus, advocate the need of addressing the relationship between financial literacy and behavior variables separately for each country, it is interesting to notice some regularity of the results. In Table 20 we summarize the results of the NLSUR estimations and we may grasp easily how many objective variables are explained by each of the regressors of interest.

In analyzing Table 20, we find being a planner (setting long-term financial goals and striving to get them) is important in all countries. This variable belongs in a factor in three of them and is significant by itself in five equations in the remaining one.

Some variables, on the other hand, seem to perform poorly, since they are correlated with very few dependent variables in all countries. This is the case of the *carpe diem* attitude (statement: “I tend to live for today and let tomorrow take care of itself”) and the understanding of the definition of interest. Of course, it is possible that these questions are relevant for dimensions of financial behavior that could not be used in estimations, due to a very low number of users, or even for behaviors not assessed by the survey.

A related issue is the possibility that there are important questions specific to certain countries, other than the set used in the OECD kit, which is widely agreed upon. In comparing the results of the present paper with those obtained in Garber & Koyama (2016), we find that all the attitude-related questions that entered some factor in the present paper, except for bold attitude (being prepared to risk some money when investing), entered one of the two attitude

Table 20 - Results Summary

|                                  | Peru | Bolivia | Ecuador | Colombia |
|----------------------------------|------|---------|---------|----------|
| Division                         | 2    | F       | 6       | 4        |
| Inflation in practice            | 2    | 3       | 3       | 2        |
| Interest definition              | 1    | 0       | 2       | 0        |
| Simple interest                  | 4    | 2       | 3       | 1        |
| Compound interest – double right | 2    | F       | 2       | 2        |
| Risk and return                  | 1    | F       | 4       | 2        |
| Inflation Definition             | 1    | F       | 3       | 2        |
| Diversification                  | 1    | 2       | 2       | 0        |
| Conscientious consumer           | 1    | 2       | 3       | 3        |
| <i>Carpe diem</i> (inv.)         | 2    | 0       | 1       | 0        |
| Impatient(inv.)                  | 1    | 1       | 4       | F        |
| Responsible                      | 0    | F       | F       | 2        |
| Bold                             | F    | F       | 2       | 1        |
| Conscientious at finance         | F    | 0       | 3       | F        |
| Planner                          | F    | F       | F       | 5        |
| Spender (inv.)                   | 3    | 0       | 6       | 2        |
| Attitude Factor                  | 6    | 8       | 6       | 3        |
| Knowledge Factor                 |      | 5       |         |          |

Note: In the top panel, we show in each cell the number of behavior variables affected by the variable in each row. Variables that belong in a factors are marked with an F, and the number of behavior variables they affect may be viewed in the lower panel, where we list the number of equations in which each factor is significant. The higher the number of behavior variables affected, the darker the color of the cell, to make visualization easier.

factors defined there. At the same time, some additional questions, not present in the CAF or OECD survey were important too, including one about the habit of buying products in installments, a common practice in Brazil. We list the questions that were important in Brazil and the information about their presence in CAF and OECD survey in Annex B.

## **5 - Conclusion**

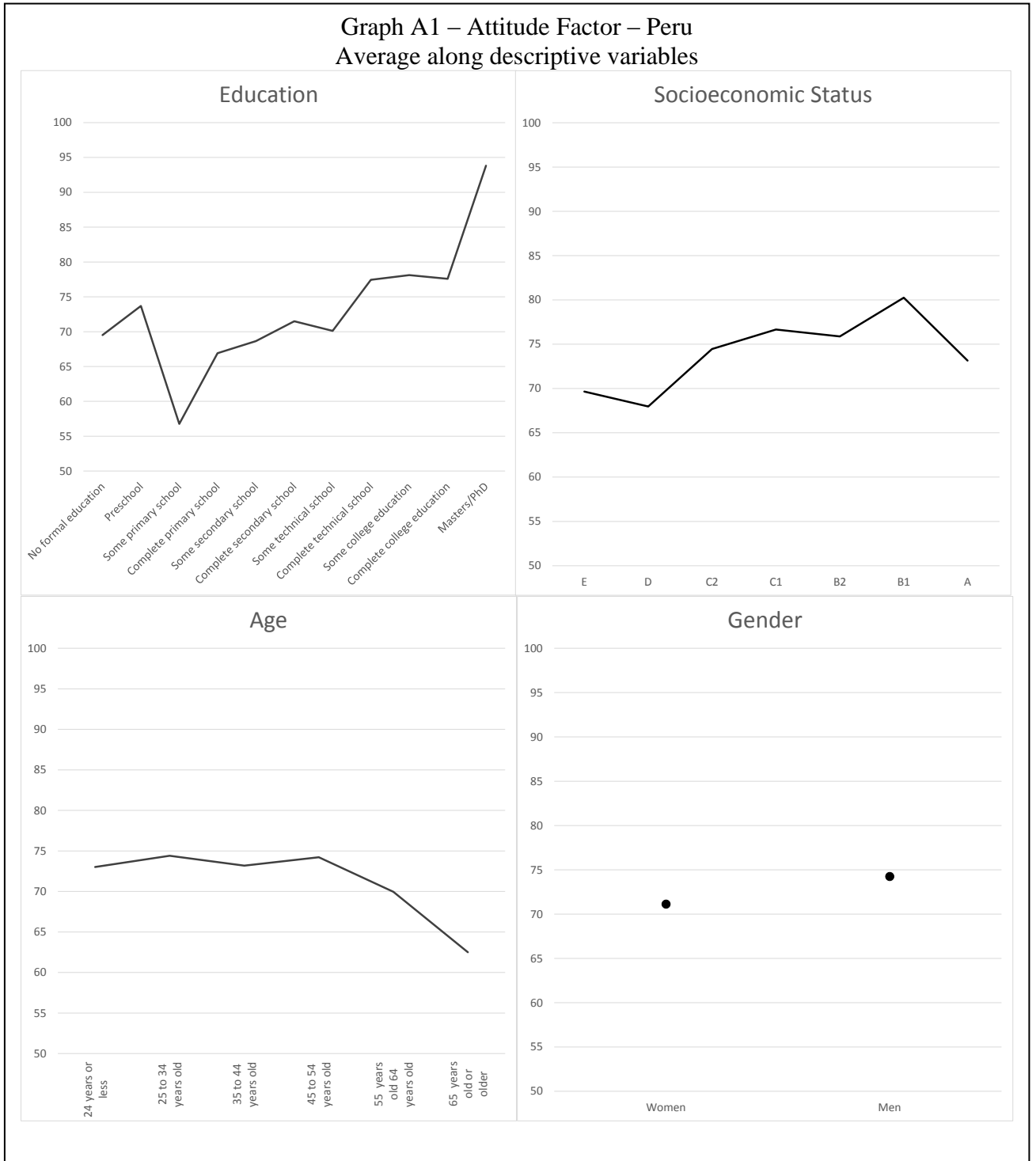
In this paper we implement for four Latin American countries a technique developed in Garber and Koyama (2016) to obtain financial knowledge and financial attitude measures that are meaningful in terms of policy objectives. In each country, the technique utilized resulted in the construction of at least one factor, and the possibility of employing controls that were significant in the equations as instruments was confirmed.

An interesting regularity is that the “weights” of the variables inside those factors are very heterogeneous among variables. This fact, combined with the notion that several knowledge and attitude variables fail to explain financial behavior, indicates that measures that sum “points” on survey questions could convey misleading measures for the design of programs aimed at enhancing financial literacy. Of course, this argument is only valid if the behavioral outcomes that we employed as targets are the ones that matter as policy goals. The fact that they were included as questions in such a careful survey appears to indicate that this is true.

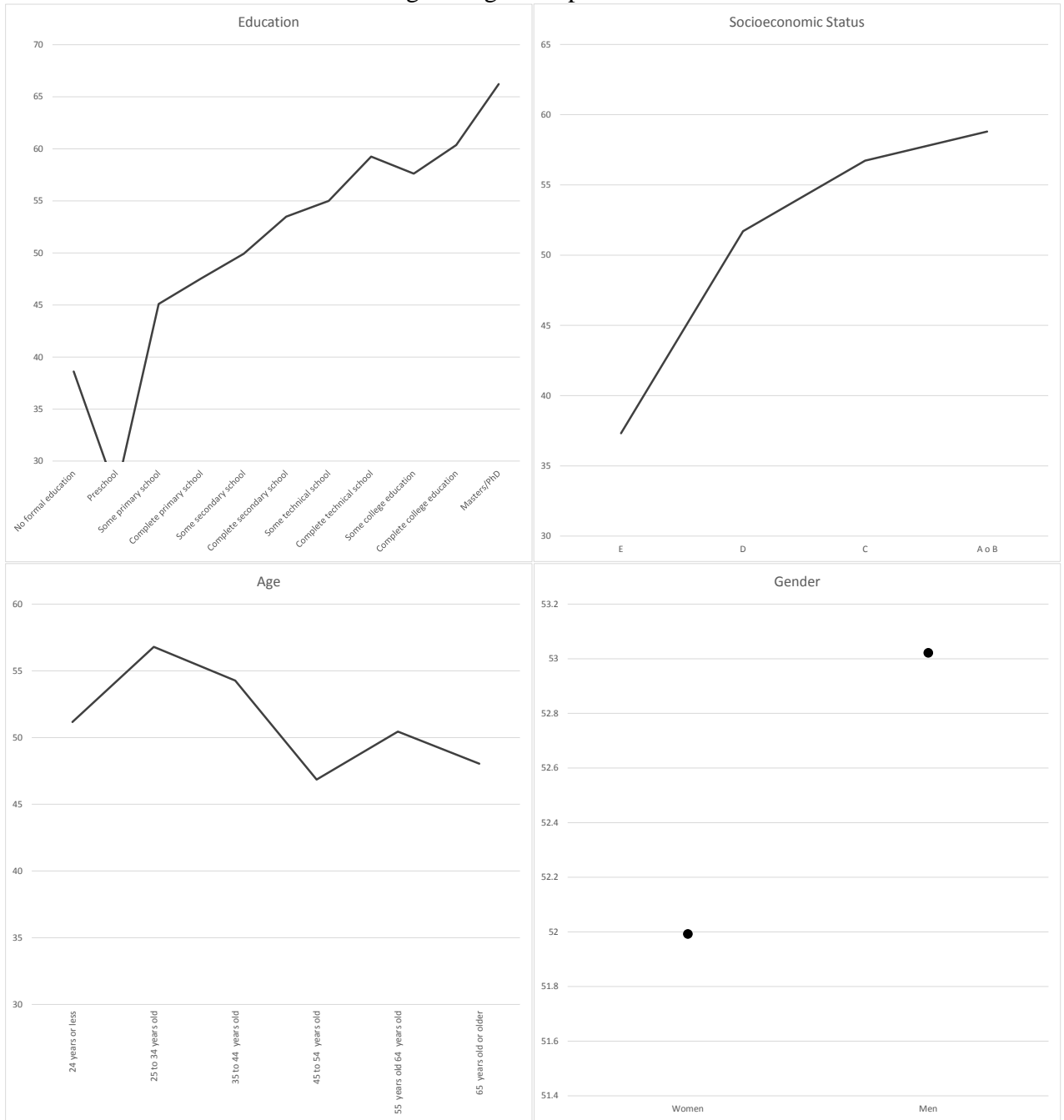
In terms of the performance of specific variables, the attitude of being a planner stands out, affecting several outcomes in all the countries analyzed.

Finally, the fact that the set of knowledge and attitude variables that affect financial behaviors varies from one country to another indicates that there may be questions not included in the survey that are relevant, even if that is only at the national level. This point is reinforced by Garber and Koyama (2016), who use the Brazilian dataset, which includes additional variables that reflect local practices.

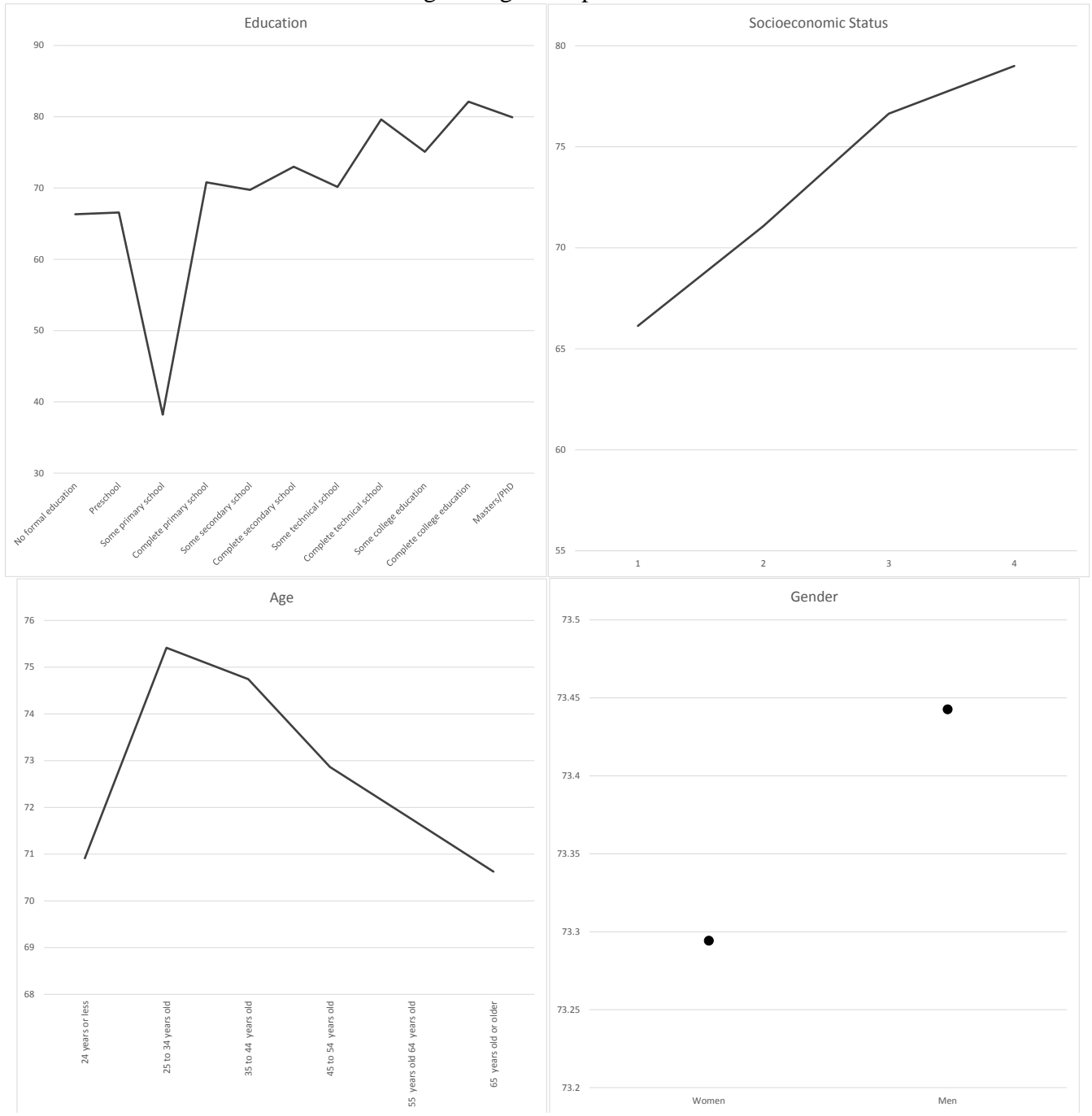
**Annex A – Graphs of factor means along observable characteristics (Peru and Bolivia)**



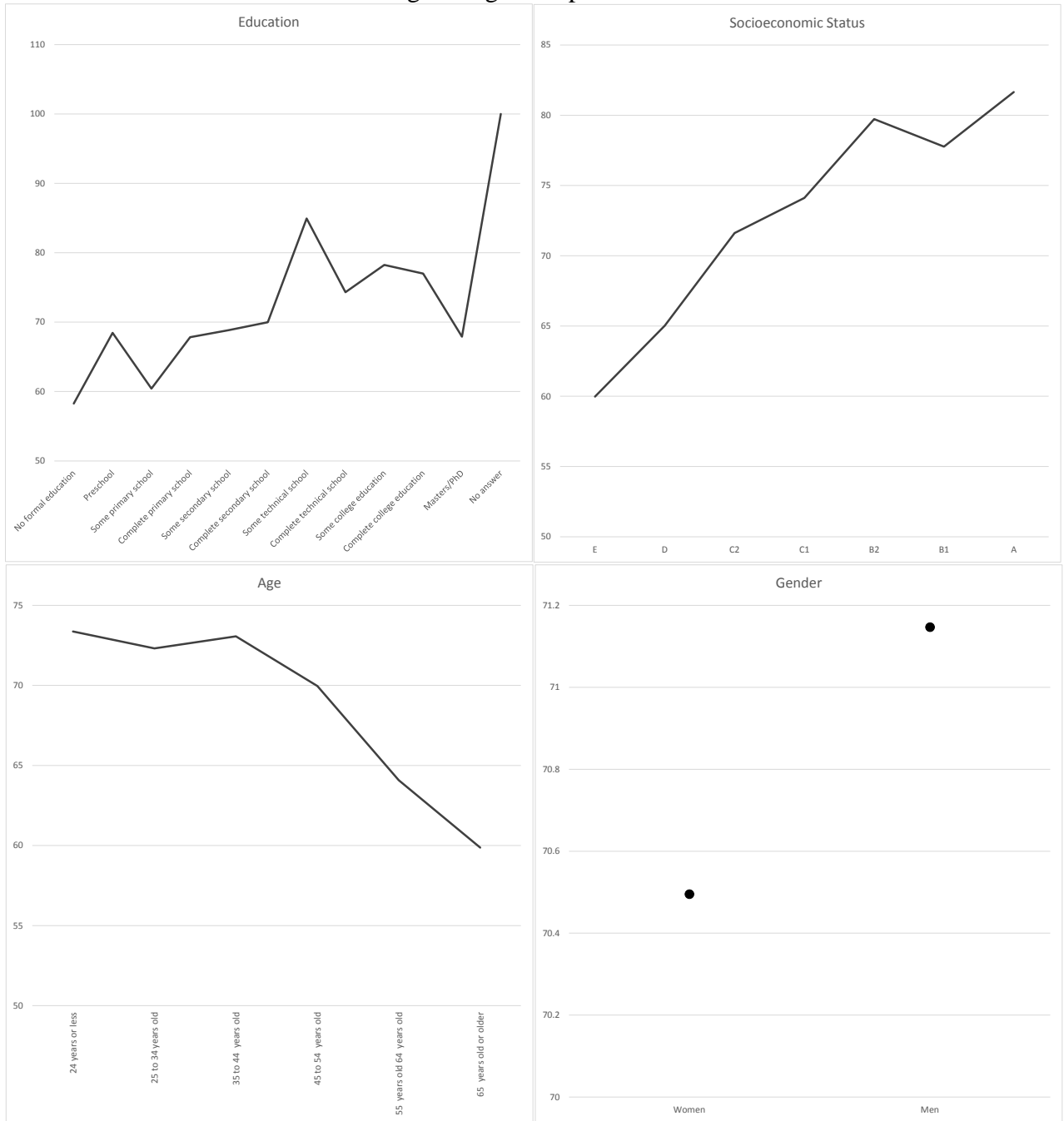
Graph A2 – Knowledge Factor – Bolivia  
Average along descriptive variables



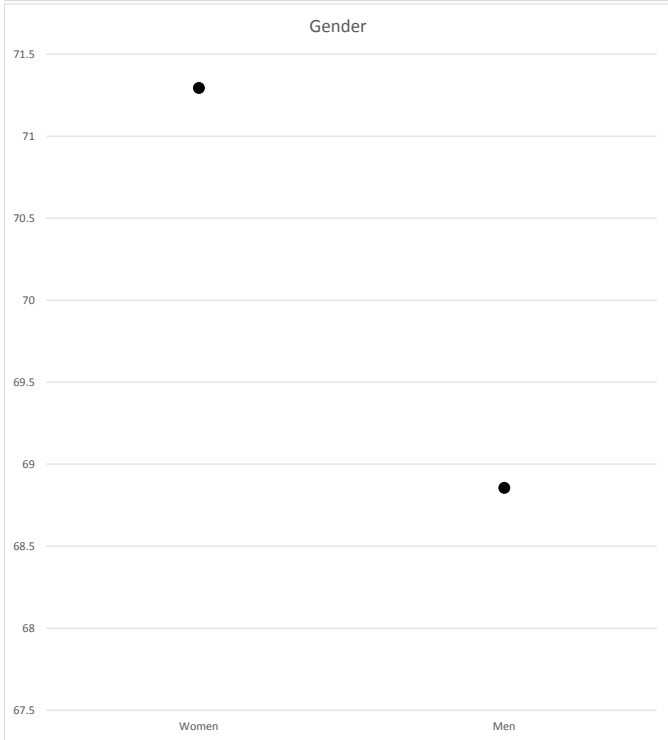
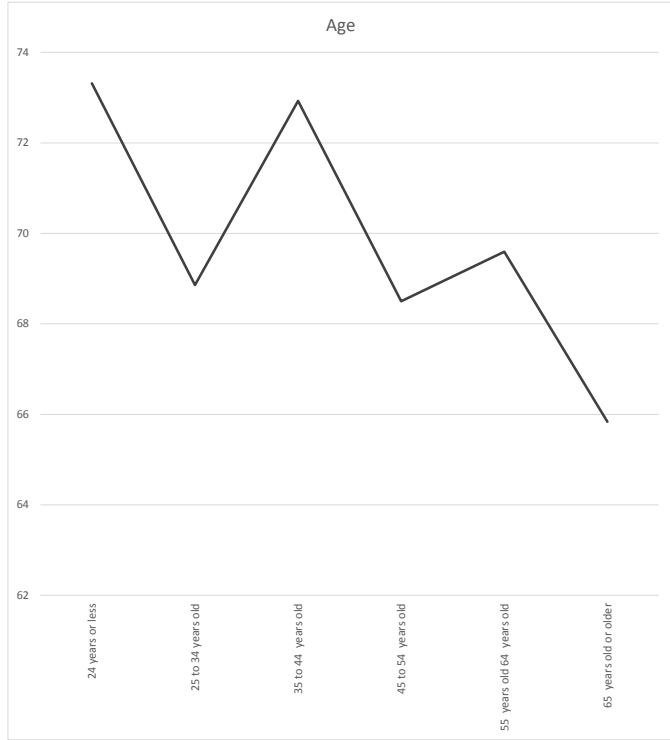
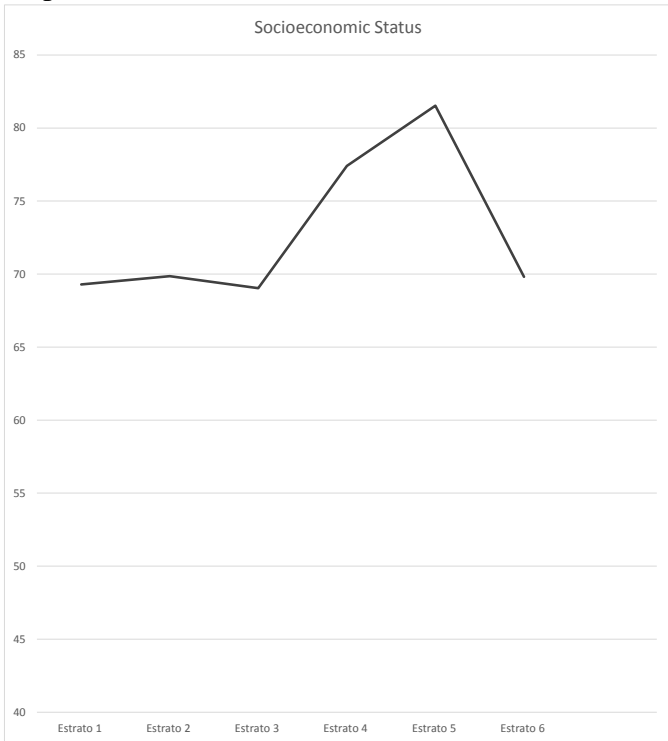
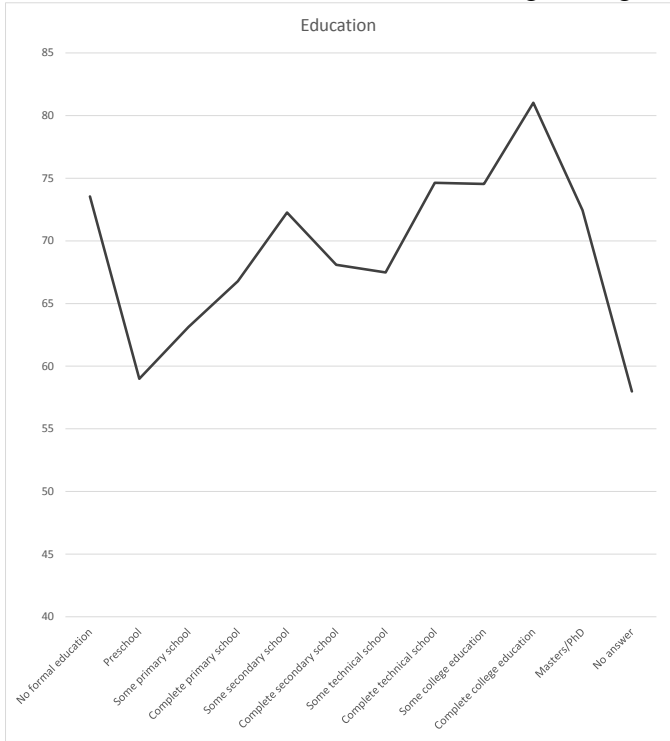
Graph A3 – Attitude Factor – Bolivia  
Average along descriptive variables



Graph A4 – Attitude Factor – Ecuador  
Average along descriptive variables



Graph A5 – Attitude Factor – Colombia  
Average along descriptive variables



## Annex B - Comparison with results for Brazil

In this section we display the knowledge and attitude questions that proved to be relevant in the Brazilian case, but were not included in the CAF survey. We reproduce the tables for knowledge and attitude factors from Garber and Koyama (2016).

Table 10 – Questions entering the Financial Knowledge Factor in Brazil

| Question   | Value assigned    | Coefficient<br>(Std. Dev.)          | OECD<br>survey | CAF<br>survey |
|--|-------------------|-------------------------------------|----------------|---------------|
| Suppose 3 friends win together R\$1500 in a lottery. If they decide to share the money equally, how much does each one get? (3 alternatives or not know)                         | dummy =1 if right | 0.984 <sup>****</sup><br>(0.240)    | Yes            | Yes           |
| A good way to control monthly expenditure is to make a budget. (True or false)   | dummy =1 if right | 0.270 <sup>*</sup><br>(0.159)       | No             | No            |
| Having the information about the interest included if a sale is made in instalments is a basic consumer right. (True or false)   | dummy =1 if right | 0.730 <sup>****</sup><br>(0.227)    | No             | No            |
| In Brazil, in 2013 what was the level of inflation? (3 alternatives or not know)   | dummy =1 if right | 0.463 <sup>****</sup><br>(0.098)    | No             | No            |
| How would you rate your level of financial knowledge on a scale of 1 to 5 where 1 is not at all knowledgeable and 5 is very knowledgeable?<br>(1 through 5, not know or refusal) | 1 through 5       | 0.248 <sup>****</sup><br>(0.051)    | Yes            | No            |
| Suppose you borrow R\$100 from a friend and pay him back R\$100 after a week. How much interest have you paid on this loan? (3 alternatives or not know)                         | dummy =1 if right | 0.379 <sup>***</sup><br>(0.1286657) | Yes            | Yes           |
| An investment with a high return is likely to be high risk. (True or false)  | dummy =1 if right | 0.357 <sup>***</sup><br>(0.130)     | Yes            | Yes           |

significant at: \*\*\*\* 0.1%, \*\*\*1%, \*\*5%, \*10%

Source: Garber and Koyama (2016)

Table 11 – Questions entering the Financial Attitude Factor 1 in Brazil

| Question   | Value assigned | Coefficient<br>(Std. Dev.) | OECD<br>survey | CAF<br>survey |
|--|----------------|----------------------------|----------------|---------------|
| How would you rate your level of financial stress? (1 through 5, not know or refusal)  | 1 through 5    | 0.253****<br>(0.050)       | No             | No            |
| I keep a close personal watch on my financial affairs (How much do you agree, 1 through 5)   | 1 through 5    | 0.113***<br>(0.044)        | Yes            | Yes           |
| I prefer to pay for a purchase in instalments than to wait until I have the money to pay for it upfront. (How much do you disagree, 1 through 5) | 1 through 5    | 0.064**<br>(0.032)         | No             | No            |
| I find it more satisfying to spend money than to save it for the long term (How much do you disagree, 1 through 5)                               | 1 through 5    | 0.107****<br>(0.033)       | Yes            | Yes           |
| I have too much debt right now (How much do you disagree, 1 through 5)   | 1 through 5    | 0.111***<br>(0.035)        | Yes            | No            |
| I am satisfied with my present financial situation (How much do you agree, 1 through 5)  | 1 through 5    | 0.135****<br>(0.035)       | Yes            | No            |

significant at: \*\*\*\* 0.1%, \*\*\* 1%, \*\*5%, \*10%

Source: Garber and Koyama (2016)

Table 12 – Questions entering the Financial Attitude Factor 2 in Brazil

| Question  | Value assigned | Coefficient<br>(Std. Dev.) | OECD<br>survey | CAF<br>survey |
|---|----------------|----------------------------|----------------|---------------|
| In general, I feel capable of managing my personal finances by myself (How much do you agree, 1 through 5)  | 1 through 5    | 0.100***<br>(0.035)        | No             | No            |
| How confident are you that you have done a good job of making financial plans for your retirement? (How much do you agree, 1 through 5)                         | 1 through 5    | 0.088***<br>(0.031)        | Yes            | No            |
| I set long term financial goals and strive to achieve them (How much do you agree, 1 through 5)   | 1 through 5    | 0.057**<br>(0.026)         | Yes            | Yes           |
| Money is there to be spent (How much do you disagree, 1 through 5)  | 1 through 5    | 0.074***<br>(0.029)        | Yes            | Yes           |
| I pay my bills on time (How much do you agree, 1 through 5)   | 1 through 5    | 0.099***<br>(0.035)        | Yes            | Yes           |
| My financial situation limits my ability to do the things that are important to me (How much do you disagree, 1 through 5)                                      | 1 through 5    | 0.067**<br>(0.027)         | Yes            | No            |
| I must admit that I purchase things because I know they will impress others (slightly different phrasing <sup>1</sup> ) (How much do you disagree, 1 through 5) | 1 through 5    | 0.066**<br>(0.027)         | Yes            | No            |

significant at: \*\*\*\* 0.1%, \*\*\*1%, \*\*5%, \*10%

Source: Garber and Koyama (2016)

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