

Factors that influence the level of financial literacy among young people: The role of parental engagement and students' experiences with money matters



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ABSTRACT

This paper focused on the family as context for financial socialization and students' experiences with money matters to explain the acquisition of financial knowledge of young people in fifteen OECD countries and economies. We used data from the second OECD PISA financial literacy assessment in 2015. Multilevel regressions of students' performance in financial literacy were presented. When explaining financial literacy differences across countries a significant predictor of financial literacy was a well-functioning educational system proxied in our study by the quality of its mathematical and scientific education. After accounting for performance in mathematics and reading and other variables, estimates of multilevel regressions by country showed that students' financial literacy was associated mainly with understanding the value of saving and discussing money matters with parents. In some countries, exposure to (and the use of) financial products – in particular, holding a bank account – improved students' financial knowledge as well.

1. Introduction

Financial literacy is a basic understanding of financial concepts. It is nowadays globally recognized as an essential life skill since consumers must be able to differentiate among a wide range of products, services, and providers of financial products to manage their finances successfully. Also, people have to take daily financial decisions about expenditures and savings. Understanding how students can manage money well remains a crucial life skill that is required for all aspects of adult life. It is becoming evident that preparation for life requires more than developing the ability to read and write and become technologically knowledgeable. However, increasing financial knowledge among young people requires previously to identify the factors that influence the learning process of financial knowledge and to formulate effective interventions by those responsible for educational policies. In some countries (e.g., Australia, the Czech Republic, or Peru), the formal education systems have been a channel for delivering financial knowledge to young people (OECD/INFE, 2015).

Nevertheless, Cole, Paulson, and Shastry (2016) found that state mandates requiring high school students to take personal finance courses did not affect financial outcomes. Hence, due to poor results,

researchers and policymakers have begun to consider students' personal experiences in effective learning of financial knowledge outside of their schools and the role that parents and family can play in this financial socialization process. Parents' financial experiences help narrow the gap in financial knowledge caused by lack of formal financial education. In this regard, Tang and Peter (2015) found that financial education, financial experience, and parents' financial experience all exert a positive impact on young adults' financial knowledge and moreover, those determinants work interactively. However, literature about children's financial socialization or the transfer of financial attitudes, values, standards, or behaviors within the context of the family is scarce (Danes, 1994). In this sense, this paper wants to contribute primarily to the better understanding of how young people acquired financial knowledge within the context of the family. For this purpose, we used the data from the OECD PISA financial literacy assessment of students (the second wave – PISA 2015). The information in this database allowed us to analyze to what extent youth experiences with money issues outside of their schools could explain their performance in financial literacy, once controlled by the socioeconomic status and achievement in math and reading among other variables.¹

As far as we know, this is the first article that has used the latest

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¹ It should be noted that information on the delivery of financial education by schools was no longer available in the second wave of PISA financial literacy assessment.

OECD data on financial literacy, and it has considered in the analysis all the participating countries in PISA 2015. Another novelty of the paper was the use of multilevel regression and the econometric treatment of endogeneity. Specifically, there were three research questions that we wanted to answer in this study:

- What is the influence of parents on their children's financial outcomes? In particular, how often students discuss monetary issues with their parents not only through the resources that they make available to them but also through direct engagement.
- How is financial literacy related to students' financial behaviors? Particularly, understanding the value of saving – if the students save money against borrowing.
- What kind of essential financial products do 15-year-olds hold? Are they related to financial literacy? Specifically, the holding of a bank account.

This paper has been structured in three parts, in addition to this introduction and conclusions. In the first part, the PISA project of the OECD of international evaluation of the financial literacy of young adolescents is summarized. In the second part, multilevel analysis of three levels is carried out to see what explains the differences in the financial literacy scores of the 15-year-olds in the fifteen countries participating in the PISA 2015 assessment. Finally, the third part of the article is the fundamental one in which the theoretical background is first addressed on how the experiences of young people with money matters and financial socialization affect their financial performance. Second, a multilevel model with two levels is estimated by country to test to what extent the hypotheses of the theoretical framework are verified. Finally, based on the results obtained, the policy implications are discussed.

2. OECD PISA financial literacy assessment of students

The Programme for International Student Assessment (PISA) is a triennial international survey. Since its first wave in 2000, PISA has tested 15-year-old students' skills and knowledge in three key domains: mathematics, reading, and science. In addition to student performance data, PISA collects information about student and school backgrounds through questionnaires that are completed by students, heads of school, and, in some countries, parents. These data help identify the factors that may influence student performance. In 2012, PISA also introduced the first optional financial literacy assessment, which became the first large-scale international study to assess youths' financial literacy. A sample of students was selected from the same schools that completed PISA's core assessments in mathematics, reading, and science.

The PISA financial literacy assessment measures the proficiency of 15-year-olds in demonstrating and applying financial knowledge and skills. The OECD (2013: 144) defines financial literacy as the “knowledge and understanding of financial concepts and risks, and the skills, motivation, and confidence to apply such knowledge and understanding in order to make effective decisions across a range of financial contexts, to improve the financial well-being of individuals and society, and to enable participation in economic life.” To design the assessment, three dimensions were considered: content, processes, and contexts (Fig. 1). *Content* comprises the areas of knowledge and understanding that are essential for financial literacy. *Processes* describe the approaches and mental strategies that are called upon to negotiate the material. *Contexts* refer to the situations in which the financial knowledge, skills, and understanding are applied, ranging from the personal to the global.²

² See OECD (2016, 2017a) with some examples of what being financially literate might mean for 15-year-olds and examples of questions that were used to assess young people.

In 2012, the optional assessment was conducted in a total of eighteen countries and economies. Around 29,000 students completed the financial literacy assessment, representing about 9 million 15-year-olds in the schools of the participating countries and economies. Also, parents, principals, and system leaders provided data on school policies, practices, resources, and other institutional factors. The first in-depth analysis using this first wave can be found in the recent work by Moreno-Herrero, Salas-Velasco, and Sánchez-Campillo (2018). Later, in 2015, the OECD assessed the economic and financial knowledge of 15-year-olds in fifteen countries. The 2015 assessment covered 125,574 students. Results from both assessments have shown that many students, in countries and economies at all levels of economic and financial development, need to improve their financial literacy (OECD, 2017a; OECD, 2014).

3. Students' financial literacy across countries: Results from PISA 2015

3.1. Student performance: mean financial literacy score by country

This sub-section compares students' proficiency in financial literacy in the 2015 PISA assessment across participating countries. As with all item response scaling models, student proficiencies were not observed. They were missing data that had to be inferred from the observed item responses.³ There were several possible alternative approaches for making this inference. Students' scores were calculated using an imputation method referred to as plausible values (PVs) which are a selection of likely proficiencies for students who attained each score. For each scale and subscale, ten plausible values per student were included in the international database. Table 1 showed the mean values of the ten plausible values per country.⁴ Students in China (B-S-J-G) scored the highest in financial literacy (566 points), which was 77 points above the OECD average.⁵ Students in other countries also scored higher than the OECD average: Belgium (the Flemish Community), Canada, Russian Federation, the Netherlands, and Australia. In the United States and Poland, 15-year-old students overall performed around the average when compared to students in other countries. The scores were below the OECD average in Italy, Spain, Lithuania, the Slovak Republic, Chile, Peru, and Brazil.

3.2. What explains financial literacy differences across countries?

Data in PISA presented a clustered or hierarchical structure, as information is gathered at the student level, students are nested within schools, and schools are nested within countries. When dealing with hierarchical data, a common approach is to use multilevel models since they recognize the existence of such hierarchy by allowing residual components at each level (e.g., Gelman & Hill, 2006; Hox, 2010; Hox & Maas, 2002). In our case, we use a three-level model, which allows for students to be grouped within schools and for schools to be grouped within countries, having residuals at the individual, schools, and country level.

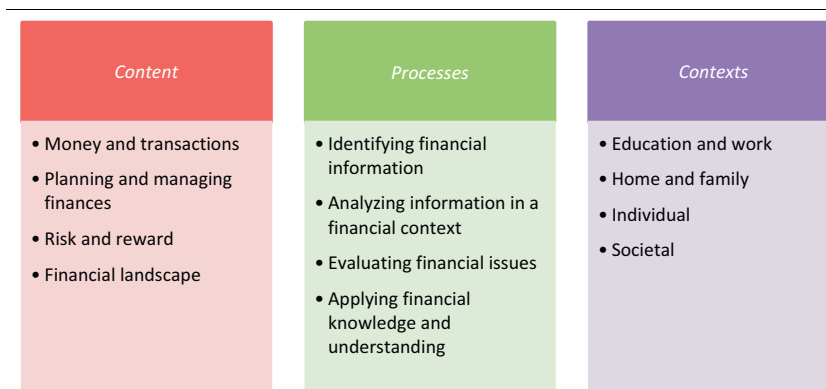
Let y_{ijk} be the test score in financial literacy for student i in school j in country k . The three-level model can be written as (*the empty or null model*).

$$y_{ijk} = \beta_0 + v_{0k} + u_{0jk} + e_{0ijk} \quad (1)$$

³ The missing values in the financial literacy items are due to the fact that students answer only a limited number of questions from the total test item pool. See OECD (2017b) for more details.

⁴ Mean values of the ten plausible values were obtained with the “repest” STATA 14 module (estimation with weighted replicate samples and plausible values). The “repest” macro was developed by OECD researchers Avvisati and Keslair (2017).

⁵ The mean score among OECD countries was 489 points.



Source: OECD (2017a, b)

Fig. 1. PISA framework for financial literacy of youth.

Table 1

The PISA 2015 assessment of financial literacy: Countries' mean performance.

Country	Mean score	Observations
China (B-S-J-G)	566.04	9841
Belgium (Flemish Community)	540.78	5675
Canadian provinces	533.23	13,082
Russian Federation	512.11	6036
Netherlands	509.26	5385
Australia	504.00	14,530
United States	487.47	5712
Poland	485.36	4478
Italy	482.87	4059
Spain	468.64	6736
Lithuania	448.60	6525
Slovak Republic	445.19	6350
Chile	432.25	7053
Peru	402.75	6971
Brazil	393.46	23,141

(1) Countries and economies are ranked in descending order of the mean financial literacy performance.

(2) The OECD average is 489 points.

(3) China (B-S-J-G) refers to the four PISA participating China provinces: Beijing, Shanghai, Jiangsu, and Guangdong.

(4) Canadian provinces refer to the seven regions that participated in the financial literacy assessment: British Columbia, Manitoba, New Brunswick, Newfoundland and Labrador, Nova Scotia, Ontario, and Prince Edward Island. Source: OECD [PISA 2015 database] and authors' calculations.

In Eq. (1), the random part has been decomposed into three parts representing respectively the error (random effect) at the student level (e_{0ijk}), the error at the school level (u_{0jk}), and the error at the country level (v_{0k}). Thus, the variance between countries is simply $\text{Var}(v_{0k}) = \sigma_{v0}^2$. Similarly, the variance between schools within countries is $\text{Var}(u_{0k}) = \sigma_{u0}^2$ and the variance between students within schools within countries is $\text{Var}(e_{0k}) = \sigma_{e0}^2$.

It is worthwhile now introducing the concept of the *intra-class correlation coefficients* (ICC) which is the ratio of one level variance to the total variance. In our case, we can build two ICCs: the ICC at the country level, which is the proportion of the variance due to differences between countries, and the ICC at the school, which is the proportion of the variance due to differences between schools. They can be defined as (Hox, 2010)

$$\text{ICC country: } \rho_3 = \frac{\sigma_{v0}^2}{\sigma_{v0}^2 + \sigma_{u0}^2 + \sigma_{e0}^2}$$

$$\text{ICC school: } \rho_2 = \frac{\sigma_{u0}^2}{\sigma_{v0}^2 + \sigma_{u0}^2 + \sigma_{e0}^2}$$

Estimates of three-level regression models are shown in Table 2.⁶ Model 1 is the null model (or the intercept-only model).⁷ The country intra-class correlation coefficient is 0.271, meaning that between-country differences account for 27.1% of the variation in students' performance in financial literacy.⁸ Table 2 also shows that 24.2% is the variance between schools (ICC equal to 0.242). Model 2 adds a country level variable. The idea is that when country-level variables are included in the model – and they have some explanatory power, we expect variance components to decrease because covariates can explain a fraction of the country-level variance which was entirely attributed to unobserved country characteristics. We consider, for each country: *Quality of math and science education*. This information comes from the World Economic Forum, Executive Opinion Survey. *The Global Competitiveness Report 2014–2015* included the question: “In your country, how would you assess the quality of math and science education? [1 = extremely poor—among the worst in the world; 7 = excellent—among the best in the world].”⁹ For example, the value for Belgium was 6.0 and for Peru was 2.3. In Model 2, the estimated coefficient associated with the explanatory variable *Quality of math and science education* is positive and statistically significant. Consequently, a very important predictor of financial literacy is a well-functioning educational system proxied in our study by the quality of its mathematical and scientific education (mathematical aptitude is indeed considered to be a necessary component of financial literacy). Analysis from Table 2 also indicates that, including *Quality of math and science education* variable, there is a decrease in the variance component from 4960.312 (estimated in Model 1) to 2034.258, which means that *Quality of math and science education* explains 59% of the between-country variation in students' financial literacy performance.

4. Variation in financial literacy performance within countries

In the analysis made in the previous section, we could also be interested in knowing what explanatory variables of level 1 (students) and level 2 (schools) appear to have a significant impact on the financial literacy scores of 15-year-olds. However, a three-level regression model including explanatory variables of the three levels simultaneously did not converge. Therefore, in this part of our research, we focus on the multilevel regression model for two-level data. In

⁶ The statistical analysis was performed with the statistical software STATA 14.

⁷ The null model doesn't include covariates other than a constant.

⁸ In another words, 27.1% of the total variance is due to cross-country variability.

⁹ *The Global Competitiveness Report* is published by the World Economic Forum.

Table 2
Multilevel analysis of countries' quality of math and science education on students' financial literacy achievement in PISA 2015.

	Model 1				Model 2			
	Coef.	Robust Std. Err.	z	P > z	Coef.	Robust Std. Err.	z	P > z
Fixed part								
Constant	480.155**	13.036	36.83	0.000	309.343**	21.915	14.12	0.000
Quality of math and science education					39.779**	5.368	7.41	0.000
Random part	Estimate	Robust Std. Err.			Estimate	Robust Std. Err.		
Variance between countries	4960.312**	3346.641			2034.258**	1086.542		
Variance between schools within the country	4431.532**	43.146			4431.500**	43.134		
Variance between students within schools within the country	8941.553**	369.301			8941.554**	369.301		
Number of countries	15				15			
Number of schools	4764				4764			
Number of students	125,574				125,574			
Log pseudolikelihood	−1.09E + 10				−1.09E + 10			
Wald chi2(1)					54.90**			
Intra-class correlation coefficients (ICC)	Coef.	Std. Err.	z	P > z				
ICC at the country level	0.271**	0.134	2.01	0.044				
ICC at the school level	0.242**	0.042	5.73	0.000				

** Significant at the 5% level of significance ($p \leq 0.05$)

a. Model 1 is the null model (or the intercept-only model). Model 2 adds a country level variable: Quality of math and science education, 1–7 (best), from *The Global Competitiveness Report (2014–2015 edition)*.

b. In the multilevel regression of three levels, as a dependent variable, only a single plausible value of the financial literacy scores was included as there were convergence problems of the models.

Source: Authors' estimations.

particular, for each country, we are interested in knowing what student-level variables related to money issues act as essential predictors of financial literacy, once taken into account other control variables of the students and their schools.

4.1. Theoretical background

Good financial decision-making requires financial literacy or a basic understanding of financial concepts. The level of financial proficiency of 15-year-old students depends on the knowledge and skills they have learned in and outside the school. In the former case, financial literacy of teenagers can be improved through courses and programs that offer financial education in schools as part of the curriculum or as pilot projects.¹⁰ In a recent meta-analysis of 126 impact evaluation studies, Kaiser and Menkhoff (2017) have found that financial education significantly impacts financial behavior and, to an even larger extent, financial literacy. These results also hold for the subsample of randomized experiments. However, it is difficult to draw general conclusions on which program features, teaching materials or teaching methods are the most effective for the development of financial competencies (OECD, 2017a). In the latter case, the effect of financial education by parents on their children's financial literacy is also relevant. This topic has been addressed in the literature, in particular, the association between how frequently young people discuss money matters with their parents and friends and their performance in financial literacy (e.g., Kagotho, Nabunya, Ssewamala, Mwangi, & Njenga, 2017). The existing research has also investigated the mechanisms behind parental influence on children's saving and borrowing behavior, and the role of parents in youth financial inclusion such as opening a bank account (e.g., Bucciol & Veronesi, 2014).

¹⁰ For example, savings programs, such as “Savings Start with the Kurus” Campaign project run by the Central Bank of the Republic of Turkey aims to raise awareness of savings among children aged between eight and 12 (OECD/INFE, 2015), the “MyPath Savings initiative” that consists of three 90-min financial education workshops (Loke, Choi, & Libby, 2015), the program “I Can Save” for elementary school children (Sherraden et al., 2011), or projects for using internet and smartphone apps to budget (Angel, 2018).

4.1.1. Parental socialization on financial literacy

Much of socialization, in general – and, thus, financial socialization, as well —, occurs within the context of the family (Danes, 1994). Parents may play an important role in their children's financial socialization. Following Jorgensen and Savla (2010), *family resource management theory* and *social learning theory* have been used to consider the perceived influence parents have on shaping the financial knowledge of young adults. The opportunities that youth may have to improve their financial literacy depend, among other things, on the average level of financial knowledge among the family members, and the frequency with which young people talk and discuss monetary issues with adults. Families communicate financial and behavioral values to their children, both explicitly and implicitly (Kagotho et al., 2017; Moschis, 1985; Shim, Barber, Card, Xiao, & Serido, 2010). This intentional or involuntary transmission of financial concepts which are required to functioning successfully in society was defined by Bowen (2002) as financial socialization. Implicitly, the socialization takes place through the observation or imitation of behaviors and signals of parents' behaviors and the unconscious communication of norms and expectations.

On the other hand, explicit financial socialization can occur, as pointed out by Sherraden, Johnson, Guo, and Elliott (2011), through direct communication about financial issues, and also through the conscious creation of opportunities that allow young people to participate in financial practices. But parents socialize children differently, perhaps due to lack of financial resources themselves or due to differences in ideas about when and how children should be included. Financial literacy of youth can be hindered if the parents have limited financial resources, experience, or access to financial services.

4.1.2. Saving and borrowing behavior of young people

Existing research has employed a variety of empirical approaches to analyzing savings behavior. While there are numerous formal economic theories for why adults save (e.g., Friedman, 1957), there is less research on actual saving among adolescents (e.g., Furnham, 1987). Evidence from the economic psychology literature suggests that children are capable of saving (Brown & Taylor, 2016). Children acquire knowledge and financial behaviors, including savings, through their

families (Gudmunson & Danes, 2011; Shim et al., 2010). As individuals' habits are formed at a young age, parents influence the development of their children's habits. For example, parents may open savings accounts on behalf of children, or talk to them about the importance of saving, and children may observe parents depositing money in savings accounts. Parents also transmit financial skills to their children by giving them pocket money and talking to them about how to manage money. Kagotho et al. (2017) also found that young people in households where parents actively engaged them in financial matters were not only likely to report their financial resources, but they were also expected to be savers themselves. However, students develop a financial, economic understanding, skills, and habits not just by talking with parents and observing their behavior but also through their personal experiences and learning by doing (Furnham, 1999; OECD, 2017a; Otto, 2013; Shug & Birkey, 1985). Heritability also plays a role in the formation of saving and borrowing behavior. Cronqvist and Siegel (2015) have found that 33% of the variation in savings behavior across individuals can be explained by genetic differences. Also, Nyhus and Webley (2001) have observed that personal traits influence saving and borrowing behavior.¹¹

In recent years, researchers have wondered whether children's savings, apart from those of their parents, significantly predict educational outcomes after controlling for parental income and assets. The relationships between children's savings and their educational outcomes have been tested in several studies (Elliott, 2009; Elliott et al., 2010, b; Elliott, Destin, & Friedline, 2011). For example, Elliott (2009) found that children's college savings were associated with close to a five-point increase in math achievement after controlling for parents' income and net worth. In this sense, policies that aimed for children's financial behavior through savings may be an alternative to reducing the transfer of financial advantage and, ultimately, educational advantage. Elliott (2013) also found that having savings designated for school might have a stronger effect on the relationship with children's college outcomes than having basic savings that can be used for any purpose. In this sense, Elliott (2013) concluded that creating national children's savings programs might help signal a psychological process in which children from an identity as college-savers. A structured savings program may provide children with the early financial inclusion that accelerates their capabilities to save and reduces an advantage typically afforded to children whose families have more financial resources (Elliott & Nam, 2012; Friedline, 2012).

4.1.3. Possession and familiarity with financial products

Increasing youth access to financial services is vital. The most basic indicator of financial inclusion is having a bank account (Grohmann & Menkhoff, 2017). However, children from families with high incomes may be exposed to a broader variety of financial resources and opportunities for financial inclusion compared to children from families with low and moderate incomes, and these differences in financial inclusion may produce gaps in children's financial capabilities (Friedline, 2012; Grinstein-Weiss, Spader, Yeo, Taylor, & Freeze, 2011). The degree of access to financial products also varies among countries. According to the PISA 2015 data,¹² there was a large variation in the proportion of students with a bank account, and the use of basic financial products by 15-year-olds varied across countries. The percentage of 15-year-olds who had an account at a formal financial institution ranged from 12% in Peru to 96% in the Netherlands. In Australia, Belgium (Flemish Community), and Canada around 75% of students hold a bank account. But in Brazil, Chile, Poland, and the Russian Federation fewer than 31% did so.¹³

¹¹ Personal traits are inherited and therefore heritability is expected to influence the saving and borrowing behavior.

¹² See Table 4.

¹³ Some countries also require parents' consent to allow 15-year-olds to open

An interesting issue to explore is the association between experiences with money matters and financial products and students' performance in financial literacy. It is expected that having some experience with money or financial products give students the opportunity to strengthen their financial knowledge. Previous studies support this view. For example, Christelis, Georgarakos, and Lusardi (2015) assessed the exposure to financial products and its effect on financial literacy, and they found that bank account ownership had a positive impact on the financial literacy of young people. However, the causality between financial inclusion and financial literacy may be difficult to prove. Do financially literate young people engage in a more financial activity (such as financial services) or do young people learn from their financial experiences and therefore become financially more literate?¹⁴ Both seem possible, as several empirical studies have shown. On the one hand, having financial knowledge and skills can raise curiosity among students for financial products (Otto, 2013; Sherraden et al., 2011). On the other hand, having a bank account allows students to become familiar with financial topics (Christelis et al., 2015; Sherraden et al., 2011) while encouraging saving habits with certain long-term benefits in adulthood (Friedline, Elliott, & Nam, 2011).

4.2. Multilevel analysis of financial variables on students' financial literacy achievement

4.2.1. Methodological framework

As we already said, for each country, PISA data have a “clustered” or “multilevel” structure: students nested within schools. The idea behind this structure is that students' achievement is affected by their characteristics and by school's characteristics they attend. Although linear regression has been used extensively in practical applications in education, nevertheless multilevel data often results in a violation of the OLS regression assumption (Goldstein, 1995). Fortunately, multilevel models take into account the two-level structure of the data avoiding that statistical problem.

Let us first consider a simple model in the context of education production where y_{ij} is a level – 1 outcome measure of the i^{th} individual in the j^{th} level-2 unit; $i = 1, 2, \dots, N$ (N is the total sample size), and $j = 1, 2, \dots, J$ (J is the number of level-2 units).¹⁵ Let y_{ij} denote the financial literacy score of the i^{th} student in the j^{th} school. The test score is a linear function of a series of covariates that can be at the student and school level plus a random part.

$$y_{ij} = \beta_0 + \beta_1 x_{ij} + u_j + e_{ij} \quad (2)$$

Eq. (2) is known as *the random intercept model*. We have included an explanatory variable at the student level (x_{ij}), but we assume that the relationship between the explanatory and dependent variable is the same in all schools, but that there was a different intercept. In other words, the slope of the relationship between y_{ij} and x_{ij} remains constant, while the intercept varies between schools. Thus, β_0 and β_1 are fixed quantities, and u_j and e_{ij} are the random part of the model representing, respectively, the error (random effect) at the school level and at the student level. Clearly, any student-level independent variables (e.g., gender, age, etc.) can be added to this model. In this paper, we are interested in financial variables such as: a) student's financial socialization; b) student' financial behavior; and c) student' financial inclusion.

(footnote continued)

and operate cash cards, prepaid cards and debit cards. This is the case in Italy, where, in addition to parents' permission, there are limitations to the operations that can be carried out by the minors with these cards. In Spain, minors over 14 years may be supplementary cardholders, but the main cardholder must be a parent/legal representative.

¹⁴ We will discuss the issue of endogeneity in more detail below.

¹⁵ Students (level 1) are nested within schools (level 2).

But multilevel modeling allows us to specify variables at any level, not just the individual one. To illustrate the model, let us include school-level independent variables (second level z-variables) in the analysis (e.g., school autonomy, school resources, etc.). We could fit a model such as.

$$y_{ij} = \beta_0 + \beta_1 x_{ij} + \beta_2 z_j + u_j + e_{ij} \quad (3)$$

The estimation of the parameters of Eq. 3, and variances of both levels, can be done with statistical software such as Stata. Each regression coefficient indicates the predicted change in y_{ij} for every one-unit increase in the value of the associated independent variable, holding constant the other variables in the model.

4.2.2. Variables used in the empirical analysis

For each country, the outcome (dependent) variable y_{ij} in our econometric model is the score for each student in the financial literacy assessment (PISA 2015).¹⁶ The independent or explanatory variables used in the multilevel analysis are explained in detail in Table 3. Table 4 shows the descriptive statistics. Taking into account the theoretical background and the availability of information in the database, we have taken into account, for each country, three groups of variables in the multilevel regression.¹⁷

First, we have included our financial variables of interest at the student level related to the student's experiences with money matters:

- Student's financial socialization (*Parental socialization*).
- Student's financial behavior (*Saving and borrowing habits*).
- Student's financial inclusion (*Owning a bank account*).

However, in all countries, there was a significant proportion of missing observations. This lack of response was due to the sampling design: half of the questions related to students' experiences with money matters were answered only by half of the sample, while the other half of questions were answered by the other half of the sample.¹⁸ This is the reason why two different econometric models have been estimated (Table 5). In Model 1, we included *Parental socialization* and *Saving and borrowing habits*. The novel approach of this paper has been to empirically decompose the variation in financial literacy across individuals into environmental and genetic components, respectively.¹⁹ In Model 2, we included youth access to financial services proxied by the *Owning a bank account* variable.

Second, control variables have been introduced at the student level, grouped into four sets:

1. To have financial knowledge, students need a basic knowledge of arithmetic or mathematics and be able to read and understand basic financial documents. Therefore, math and reading skills can be considered as prerequisites for financial education, which have been approximated by:

- *Mathematics performance in PISA 2015*.
- *Reading performance in PISA 2015*.

2. The second group of control variables measures socio-demographic aspects of students. For example, we want to test whether there are gender differences in the average scores in financial literacy, or if there is a strong link between financial literacy and socioeconomic status. The variables finally included have been: *Age*, *Gender* (*female* = 1), *Immigrant* vs. *native*, *Grade repetition*, and *Index of Educational, Social and Cultural Status* which has been built to be internationally comparable.
3. Many young people use digital financial services such as making online payments using the Internet or making a transaction using a mobile phone. These practices can have a positive effect on the development of economic-financial competencies. But this information is not available in the database. Therefore, we use a broad variable related to new technologies: *Information and communication technology resources*.
4. Last, a problem in cross-sectional analysis is the unobserved heterogeneity. Some pertinent aspects of economic behavior are not captured by an econometric model, either because they are not observable or measurable, or because they are not captured by the underlying economic theory. As a consequence, heterogeneity may arise.²⁰ Controlling for unobserved heterogeneity is indeed a fundamental challenge in empirical education research. We have considered three variables related to the personality of individuals to try to capture the heterogeneity between students²¹: *Expected years of education*, *Sense of belonging*, and *Achievement motivation*.²²

Finally, contextual variables related to the schools have been included in the multilevel regression as control variables: *The average class size*, *School responsibility on curriculum and assessment*, *Shortage of educational material*, *Extra-curricular activities at school*, and *Help with homework by school teachers*.

4.2.3. Results

This section presents cross-country evidence of the direct effects of money matter variables on financial literacy, once the performance in mathematics and reading has been controlled.²³ Table 5 shows the results of the econometric estimation. The first finding that stands out, and that is common to all countries, is the significance of the coefficients associated with mathematics and reading performance.²⁴ Mathematics and reading can capture general cognitive abilities. To be financially literate, students need to be able to read and understand basic financial documents. Also, students need to have at least a basic level of math ability to be financially literate.

It should be noted that the effects are very significant in statistical terms since the p -value < .001 in all cases (not shown). Taking into account that the correlations between financial literacy and both competences – mathematics and reading performance – are high (0.74 and 0.75, respectively),²⁵ it can be concluded that the effects are quantitatively high (Cohen, 1988). In most countries and economies, changes in average financial literacy performance between 2012 and

¹⁶ In the multilevel analysis, we used, simultaneously, the ten values on financial literacy (PV@FLIT) by the “mi” (multiple-imputation) option of STATA 14.

¹⁷ For reasons of space, the correlation matrix between these variables is not shown. But we have proven that there are no serious problems of multicollinearity. Readers interested in having this matrix can request it from the authors.

¹⁸ Information about money and financial matters was collected in an additional questionnaire in PISA 2015.

¹⁹ We verified that there was no correlation between these two explanatory variables. Therefore, understanding the value of saving vs. a positive view of borrowing (*Saving and borrowing habits* variable) would rather have an innate character related to the personality of the individuals.

²⁰ Unobserved heterogeneity is conceptualized as a vector of missing variables acting through the error term. One might worry that omitted variables influence financial literacy in ways that could bias results.

²¹ Unobserved heterogeneity usually consists of any unobserved difference such as ability or effort on education outcomes. For example, Mandell and Klein (2007) pointed out that motivation and ambition may be useful for encouraging students to learn and to help them apply what they know to financial situations that require a certain determination.

²² The unobserved heterogeneity is corrected if these omitted variables are included in the regression but they are not correlated with the explanatory variables already included, something that we verified.

²³ Numeracy and literacy are a precondition for financial literacy. They are indeed highly correlated.

²⁴ Although the values of the coefficients are relatively small (< 1).

²⁵ See OECD (2017a).

Table 3
Explanatory variables: Labels and description.

Financial variables of level 1 (student variables) ¹	
<i>Student's financial socialization</i>	
Parental socialization	Set of dummy variables that take the value 1 according to the students' answers to the question: "How often do you discuss money matters (e.g. talk about spending, saving, banking, investment) with parents/guardians or other adult relations?" Never or hardly ever (Parental socialization 01 = 1). Once or twice a month (Parental socialization 02 = 1). Once or twice a week (Parental socialization 03 = 1). Almost every day (Parental socialization 04 = 1).
<i>Student's financial behavior</i>	
Saving and borrowing habits	A binary variable that takes the value 1 if the student answered "Save up to buy it" to the question: "If you don't have enough money to buy something you really want (e.g., an item of clothing, sports equipment), what are you most likely to do?" This variable takes the value 0 if the student had a positive view of borrowing.
<i>Student's financial inclusion</i>	
Owning a bank account	A binary variable that takes the value 1 if the student owns a bank account; and take the value 0 otherwise.
Control variables of level 1 (student variables) ²	
Expected years of education	Set of dummy variables that take the value 1 according to the students' answers to the question: "Which of the following levels of education do you expect to complete?" ISCED 2 Lower secondary level of education (2A, 2B, 2C) (Expected years of education: Lower secondary education = 1). ISCED 3 Upper secondary level of education (3A, 3B, 3C) or ISCED 4 Post-secondary, non-tertiary education (4A, 4B, 4C) (Expected years of education: Upper secondary education = 1). ISCED 5 First stage of tertiary education (5A, 5B) or ISCED 6 Second stage of tertiary education (leading to an advanced research qualification) (Expected years of education: Tertiary secondary education = 1).
Sense of belonging	The index of a sense of belonging (BELONG) was constructed from students' responses to a trend question about their sense of belonging at school. Students reported, on a four-point Likert scale with the response categories "strongly agree," "agree," "disagree," and "strongly disagree," their agreement with the following statements (ST034): "I feel like an outsider (or left out of things) at school;" "I make friends easily at school;" "I feel like I belong at school;" "I feel awkward and out of place in my school;" "Other students seem to like me;" and "I feel lonely at school." The answers to three items were reversed-coded so that higher values in the index indicate a greater sense of belonging.
Achievement motivation	The index of achievement motivation (MOTIVAT) was constructed from students' responses to a new question developed for PISA 2015 (ST119). Students reported, on a four-point Likert scale with the answering categories "strongly disagree," "disagree," "agree," and "strongly agree," their agreement with the following statements: "I want top grades in most or all of my courses;" "I want to be able to select from among the best opportunities available when I graduate;" "I want to be the best, whatever I do;" "I see myself as an ambitious person;" and "I want to be one of the best students in my class." Higher values indicate that students have greater achievement motivation.
Mathematics performance in PISA 2015	First plausible value for the PISA domains of mathematics (PV1MATH).
Reading performance in PISA 2015	First plausible value for the PISA domains of reading (PV1READ).
Age	Student's age.
Gender (female = 1)	Gender (female = 1) A dichotomous variable that takes the value of 1 for girls and takes the value of 0 for boys.
Immigrant vs. native	The student's immigration status has been incorporated into our econometric estimation as a binary variable: immigrant = 1; native = 0.
Grade repetition	The grade repetition variable (REPEAT) took the value of "1" if the student had repeated a grade in at least one ISCED level and the value of "0" if "no, never" was chosen at least once, given that none of the repeated grade categories were chosen. The index is assigned a missing value if none of the three categories were ticked at any levels.
Index of educational, social and cultural status	The PISA Index of Economic, Social and Cultural Status (ESCS) is a composite score built by the indicators: parental education (PARED), highest parental occupation (HISEI), and home possessions (HOMEPOS) including books in the home via principal component analysis (PCA). As no direct income measure has been available from the PISA data, the existence of household items has been used as a proxy for family wealth. See <i>PISA 2015 Technical Report</i> (OECD, 2017b) for more details.
Information and communication technology resources	In PISA 2015, students reported the availability of several household items at home, and also they reported the amount of possessions and books at home. Different indices were derived from these items. One of those was ICT resources (ICTRES). Items used to build this index were: Educational software. A link to the Internet. Cell phones with Internet access (e.g., smartphones). Computers (desktop computer, portable laptop, or notebook). Tablet computers E-book readers.
Control variables of level 2 (school variables) ³	
The average class size	The average class size (CLSIZE) is derived from one of nine possible categories in question SC003, ranging from "15 students or fewer" to "> 50 students.
School responsibility on curriculum and assessment	An index of the relative level of responsibility of school staff in issues relating to curriculum and assessment (RESPCUR) was computed from the school principal's report regarding who had responsibility for four aspects of curriculum and assessment, namely "establishing student assessment policies", "choosing which textbooks are used", "determining course content", and "deciding which courses are offered". The index was calculated by the ratio of "yes" responses for school governing board, principal or teachers, on the one hand, to "yes" responses for regional/local education authority or national educational authority on the other hand. Higher values indicated relatively higher levels of school responsibility in this area. The index

(continued on next page)

Table 3 (continued)

Control variables of level 2 (school variables) ³	
Shortage of educational material	<p>was standardized to having an OECD mean of '0' and a standard deviation of '1' for the pooled data with equally weighted country samples).</p> <p>PISA 2015 included a question with items about school resources, measuring the school principals' perceptions of potential factors hindering the provision of instruction at school. The four response categories were "not at all," "very little," "to some extent," to "a lot." The index on the shortage of educational material (EDUSHORT) was scaled using four items:</p> <p>A lack of educational material (e.g., textbooks, IT equipment, library or laboratory material).</p> <p>Inadequate or poor quality educational material (e.g., textbooks, IT equipment, library or laboratory material).</p> <p>A lack of physical infrastructure (e.g., building, grounds, heating/cooling, lighting, and acoustic systems).</p> <p>Inadequate or poor quality physical infrastructure (e.g., building, grounds, heating/cooling, lighting, and acoustic systems).</p> <p>The items were not reversed for scaling.</p>
Extra-curricular activities at school	<p>School principals were asked to report what extra-curricular activities their schools offered to 15-year old students (SC053). The index of creative extra-curricular activities at school (CREACTIV) was computed as the total number of the following activities that occurred at school: i) band, orchestra or choir; ii) school play or school musical; and iii) art club or art activities.</p>
Help with homework by school teachers	<p>A binary variable that takes the value 1 if the school teachers help the students with their homework; take the value 0 otherwise.</p>

Source: OECD (2017b) and authors' elaboration.

¹ Variables from PISA 2015 Financial Literacy background questionnaire.

² Variables from PISA 2015 Student Questionnaire.

³ Variables from PISA 2015 School Questionnaire.

2015 are qualitatively consistent with changes in mathematics, reading and science performance over the same period. But, is financial literacy only about mathematics and reading?

Let's focus first on the financial variables. About Model 1, the results of the econometric estimation allow us to answer two of our research questions.

- Can the financial socialization that youth received from their parents predict their financial literacy?

In all countries and economies where the assessment of young people's financial literacy was made, > 50% of the surveyed students reported that they discussed money matters with their parents on a weekly or monthly basis (OECD, 2017a, 2017b). In our research, discussing money matters with parents is associated with higher financial literacy scores in nine participating countries, after accounting for performance in mathematics and reading and other characteristics. Specifically, in Australia, Belgium (F.C.), Brazil, Chile, Lithuania, the Netherlands, Poland, the Russian Federation, and the Slovak Republic talking with parents about money matters increases the financial literacy score above 10 points.

This positive relationship between discussing money matters with parents and higher financial literacy has also been found by Mimura, Koonce, Plunkett, and Pleskus (2015) whose results suggested that personal financial information obtained from parents was positively associated with levels of financial knowledge and financial practices. The idea is that because parents are the key influence in children's lives as they grow, the knowledge young adults have about money are primarily influenced by their parents (Jorgensen & Savla, 2010). Children who discuss financial issues with their parents are stimulated to think about financial matters, which increases their financial awareness.

- How is financial literacy related to students' financial behaviors?

15-year-olds who do not have enough money to buy something they want, they prefer to save it versus borrowing it. After accounting for performance in mathematics and reading and other characteristics, students' financial literacy is associated with understanding the value of saving (*Saving and borrowing habits*). The coefficient estimated associated to this variable is positive and statistically significant of a value above 9 points in 10 out of 15 countries, highlighting Brazil (25 points), Lithuania (20) and Slovakia (17). In this sense, Silva, Magro, Gorla, and Nakamura (2017) find that some high school students tend to save resources only to spend them when needed, but a significant portion

saves money only when possible.

About Model 2, it is verified that students who hold a bank account – in Australia, Belgium, Canada, and Spain – perform better in financial literacy than students (of similar socio-economic status...) who do not have a bank account. In these countries, students who hold a bank account score around 10 points higher than students who do not own a bank account.²⁶

What are the other factors (gender, socio-economic and immigrant background, ...) explaining the inequalities within countries? We summarize the coefficients (statistically significant) related to the students' characteristics.

First, gender differences in financial literacy may be related to different opportunities for learning, different contexts in which men and women grow up and live, and to a possible variation of these factors across generations (OECD, 2017a). In half of the countries in our study, there are no differences in financial literacy between boys and girls. But gender differences in financial literacy performance are observed in Australia, China, Italy, the Russian Federation, and the United States, where boys score higher than girls even after controlling by other variables including performance in mathematics and reading. The opposite is found in Poland and in the Slovak Republic where girls perform better than boys.

Second, after controlling for other individual and school variables, students' socioeconomic status and immigrant background explain the performance in financial literacy. In the former case, the results indicate that the economic, social, and cultural index (ESCS) explains achievements in financial literacy in Australia, Belgium (F.C.), and the USA. The estimated coefficients are positive and statistically significant between 5 and 7 points. The value of the coefficient of the variable ESCS is interpreted as an increase in financial literacy associated with a one-point increase in the ESCS. Concerning the immigrant status, financial education is considered important for the integration of immigrants in their new country of residence. In many countries, children of immigrants have a higher risk of poorer academic performance than children of natives (OECD, 2012). Our results show that, after taking into account other school and students' characteristics, an immigration background has a negative effect on the students' achievement in Australia, the participating Canadian provinces, and China.

Third, grade repetition has a negative effect on students' achievement. Boys and girls who are left behind scored significantly lower than

²⁶ Assuming that it is an exogenous explanatory variable. We will return to this issue later.

Table 4
Descriptive statistics of the explanatory variables considered in the econometric estimation (the standard deviation is only shown for continuous variables).

	Australia			Belgium (Flemish)			Brazil			Canada			Chile		
	Model 1		S. D.	Model 2		S. D.	Model 1		S. D.	Model 1		S. D.	Model 1		S. D.
	Mean	Mean		Mean	Mean		Mean	Mean		Mean	Mean		Mean	Mean	
Parental socialization 01	0.16	0.16		0.16	0.20		0.20	0.14		0.14	0.17		0.17	0.30	
Parental socialization 02	0.34	0.38		0.38	0.26		0.26	0.33		0.33	0.30		0.30	0.30	
Parental socialization 03	0.37	0.33		0.33	0.23		0.23	0.37		0.37	0.30		0.30	0.23	
Parental socialization 04	0.12	0.13		0.13	0.31		0.31	0.16		0.16	0.70		0.70	0.31	
Saving and borrowing habits	0.66	0.59		0.59	0.60		0.60	0.61		0.61	0.78		0.78	0.00	
Owning a bank account		0.79		0.75	0.29		0.29	0.03		0.03	0.03		0.03	0.17	
Expected years of education: Lower secondary education	0.03	0.03		0.01	0.01		0.01	0.21		0.21	0.77		0.77	0.83	
Expected years of education: Upper secondary education	0.43	0.43		0.38	0.34		0.34	0.21		0.21	0.17		0.17	0.83	
Expected years of education: Tertiary secondary education	0.53	0.53		0.62	0.61		0.65	0.77		0.77	0.83		0.83	0.07	
Sense of belonging	1.01	1.12	11.11	0.03	0.82	0.82	0.10	1.00	0.11	1.00	0.08	1.04	0.08	1.04	1.04
Achievement motivation	1.11	1.21	9.53	0.03	0.79	0.79	0.19	0.80	0.19	0.80	0.34	0.95	0.34	0.95	0.95
Mathematics performance in PISA 2015	487.27	486.62	94.35	523.51	521.52	93.06	393.08	391.25	89.33	504.03	447.50	88.47	446.68	88.42	88.42
Reading performance in PISA 2015	494.92	494.21	104.69	515.79	513.94	97.47	423.52	421.83	96.03	519.34	479.44	88.12	478.66	88.55	88.55
Age	15.78	0.29	15.78	15.84	0.29	15.84	15.88	0.29	15.88	0.29	15.86	0.29	15.86	0.29	15.81
Gender (female = 1)	0.49	0.49		0.49	0.52		0.52	0.50		0.50	0.51		0.51	0.51	
Immigrant vs. native	0.11	0.11		0.08	0.01		0.01	0.12		0.12	0.02		0.02	0.03	
Grade repetition	0.10	0.10		0.22	0.27		0.27	0.04		0.04	0.18		0.18	0.19	
Index of Educational, Social and Cultural Status	0.21	0.82	0.21	0.87	0.20	0.88	0.74	1.15	0.71	1.13	0.48	0.81	0.48	0.82	0.82
Information and communication technology resources	0.69	4.20	0.70	4.31	0.84	0.83	0.96	0.90	0.93	0.90	1.01	0.45	1.01	0.45	1.01
The average class size	25.56	6.92	25.53	18.72	5.10	18.70	35.56	8.26	35.57	8.36	24.76	4.36	32.56	7.57	7.57
School responsibility on curriculum and assessment	60.299.4	774.223.4	59.963.6	772.077.7	0.58	0.96	0.29	0.90	0.29	0.90	0.66	0.57	0.21	0.99	0.99
Shortage of educational material	2.39	16.38	2.39	16.37	0.01	0.89	0.00	0.88	0.13	1.13	0.77	0.39	0.76	0.74	0.74
Extra-curricular activities at school	73.222.9	852.597.7	70.673.7	837.731.5	1.11	0.94	1.35	0.98	1.36	0.99	2.65	0.63	2.65	0.63	2.18
Help with homework by school teachers	0.89	0.89		0.52	0.21		0.21	0.92		0.92	0.93		0.93	0.33	
Number of obs.	9287	9339		987	1131		1131	1118		1118	2532		2528	1401	1393

	China			Italy			Lithuania			Netherlands			Peru		
	Model 1		S. D.	Model 2		S. D.	Model 1		S. D.	Model 1		S. D.	Model 1		S. D.
	Mean	Mean		Mean	Mean		Mean	Mean		Mean	Mean		Mean	Mean	
Parental socialization 01	0.20	0.17		0.17	0.12		0.12	0.12		0.12	0.18		0.18	0.26	
Parental socialization 02	0.40	0.24		0.24	0.28		0.28	0.37		0.37	0.26		0.26	0.28	
Parental socialization 03	0.31	0.37		0.37	0.38		0.38	0.38		0.38	0.27		0.27	0.74	
Parental socialization 04	0.08	0.23		0.23	0.23		0.23	0.13		0.13	0.74		0.74	0.12	
Saving and borrowing habits	0.69	0.58		0.58	0.59		0.59	0.67		0.67	0.96		0.96	0.01	
Owning a bank account		0.49		0.37	0.37		0.37	0.03		0.03	0.14		0.14	0.23	
Expected years of education: Lower secondary education	0.07	0.08		0.02	0.03		0.03	0.40		0.40	0.76		0.76	0.82	
Expected years of education: Upper secondary education	0.34	0.34		0.38	0.28		0.28	0.40		0.40	0.83		0.83	0.80	
Expected years of education: Tertiary secondary education	0.59	0.59		0.60	0.60		0.60	0.69		0.69	0.83		0.83	0.80	
Sense of belonging	0.20	0.80	0.20	0.87	0.01	0.88	0.27	1.09	0.26	1.09	0.18	0.83	0.18	0.83	0.82
Achievement motivation	0.20	0.87	0.19	0.86	0.17	0.87	0.02	1.03	0.02	1.03	0.71	0.48	0.71	0.33	0.80
Mathematics performance in PISA 2015	547.17	97.67	547.24	97.77	495.97	89.90	495.35	89.23	477.99	86.07	524.37	85.82	524.37	85.86	81.75
Reading performance in PISA 2015	511.63	101.54	511.64	101.82	496.21	91.20	496.52	91.21	471.53	91.66	518.03	92.08	518.03	91.78	86.00
Age	15.74	0.30	15.74	0.30	15.81	0.29	15.81	0.28	15.82	0.28	15.71	0.28	15.71	15.82	0.29

(continued on next page)

Table 4 (continued)

	China				Italy				Lithuania				Netherlands				Peru			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	Mean	S. D.	Mean	S. D.	Mean	S. D.	Mean	S. D.	Mean	S. D.	Mean	S. D.	Mean	S. D.	Mean	S. D.	Mean	S. D.	Mean	S. D.
Gender (female = 1)	0.47		0.47		0.49		0.49		0.52		0.51		0.51		0.50		0.46		0.45	
Immigrant vs. native	0.00		0.00		0.06		0.05		0.01		0.01		0.02		0.02		0.02		0.02	
Grade repetition	0.17		0.17		0.10		0.10		0.02		0.02		0.21		0.21		0.26		0.25	
Index of Educational, Social and Cultural Status	−0.86	1.11	−0.85	1.11	−0.03	0.92	−0.04	0.92	−0.07	0.87	−0.07	0.87	0.19	0.75	0.19	0.74	−0.91	1.24	−0.91	1.24
Information and communication technology resources	−0.82	1.01	−0.82	1.00	−0.21	0.77	−0.22	0.77	−0.32	0.77	−0.31	0.77	0.55	0.80	0.55	0.80	−1.44	1.20	−1.44	1.20
The average class size	41.89	8.82	41.89	8.83	23.21	6.26	23.19	6.30	23.71	5.28	23.73	5.28	26.80	4.56	26.77	4.51	28.02	8.48	27.95	8.43
School responsibility on curriculum and assessment	−0.89	0.50	−0.90	0.50	0.42	0.93	0.40	0.93	0.59	0.91	0.58	0.92	1.19	0.61	1.19	0.62	−0.30	0.96	−0.29	0.97
Shortage of educational material	0.04	1.24	0.04	1.24	0.61	1.16	0.63	1.16	0.27	1.02	0.27	1.02	−0.23	0.86	−0.22	0.86	0.43	1.39	0.44	1.39
Extra-curricular activities at school	2.29	0.85	2.29	0.85	1.32	0.95	1.32	0.96	2.27	0.72	2.27	0.72	1.77	1.01	1.77	1.01	1.67	1.02	1.65	1.02
Help with homework by school teachers	0.71		0.71		0.22		0.22		0.75		0.76		0.54		0.54		0.30		0.29	
Number of obs.	2328		2315		576		567		1495		1499		780		779		923		865	
	Poland				Russian Federation				Slovak Republic				Spain				USA			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	Mean	S. D.	Mean	S. D.	Mean	S. D.	Mean	S. D.	Mean	S. D.	Mean	S. D.	Mean	S. D.	Mean	S. D.	Mean	S. D.	Mean	S. D.
Parental socialization 01	0.15		0.27		0.13		0.13		0.20		0.20		0.21		0.12		0.12		0.12	
Parental socialization 02	0.35		0.02		0.29		0.10		0.34		0.34		0.29		0.34		0.00		0.34	
Parental socialization 03	0.35		0.48		0.38		0.39		0.31		0.31		0.32		0.34		0.16		0.15	
Parental socialization 04	0.14		0.51		0.19		0.52		0.15		0.15		0.18		0.21		0.84		0.84	
Saving and borrowing habits	0.59		0.27		0.71		0.28		0.53		0.42		0.66		0.69		0.52		0.52	
Owning a bank account									no obs.		no obs.		no obs.		no obs.		0.00		0.00	
Expected years of education: Lower secondary education	0.02		0.02		0.10		0.10		no obs.		no obs.		0.11		0.11		0.00		0.00	
Expected years of education: Upper secondary education	0.48		0.48		0.38		0.39		no obs.		no obs.		0.23		0.23		0.16		0.15	
Expected years of education: Tertiary secondary education	0.51		0.51		0.52		0.52		no obs.		no obs.		0.66		0.66		0.84		0.84	
Sense of belonging	−0.29	0.89	−0.29	0.89	−0.35	0.79	−0.36	0.79	−0.25	0.84	−0.25	0.84	0.48	1.15	0.47	1.15	−0.02	1.06	−0.02	1.06
Achievement motivation	−0.40	0.83	−0.41	0.83	−0.10	0.85	−0.10	0.86	−0.31	0.86	−0.32	0.86	−0.16	0.91	−0.16	0.91	0.65	0.94	0.66	0.94
Mathematics performance in PISA 2015	506.89	83.65	506.86	83.54	496.30	82.57	496.67	82.55	479.08	89.54	478.13	89.80	491.82	83.27	492.15	82.77	476.81	86.06	476.85	85.79
Reading performance in PISA 2015	509.27	84.07	509.40	83.98	496.49	83.40	497.09	83.10	455.99	89.50	455.11	89.47	502.20	83.78	501.71	83.99	505.43	96.27	505.57	95.94
Age	15.71	0.28	15.71	0.28	15.82	0.29	15.81	0.29	15.80	0.28	15.80	0.28	15.87	0.28	15.87	0.28	15.81	0.29	15.81	0.29
Gender (female = 1)	0.50		0.50		0.51		0.50		0.47		0.46		0.50		0.50		0.50		0.50	
Immigrant vs. native	0.01		0.01		0.03		0.02		0.01		0.01		0.10		0.11		0.06		0.06	
Grade repetition	0.04		0.04		0.02		0.02		0.05		0.06		0.26		0.26		0.09		0.09	
Index of Educational, Social and Cultural Status	−0.39	0.82	−0.39	0.82	0.01	0.73	0.01	0.72	−0.13	0.86	−0.13	0.86	−0.42	1.19	−0.42	1.19	0.20	0.97	0.20	0.97
Information and communication technology resources	−0.25	0.78	−0.26	0.78	−0.38	0.81	−0.38	0.80	−0.22	0.75	−0.23	0.75	0.01	0.88	0.01	0.88	0.25	1.15	0.26	1.15
The average class size	24.68	7.07	24.69	7.12	23.16	4.49	23.19	4.48	22.37	4.30	22.37	4.27	26.73	6.60	26.71	6.56	25.94	5.50	25.94	5.50
School responsibility on curriculum and assessment	0.51	0.85	0.51	0.85	−0.03	0.94	−0.03	0.94	0.55	1.00	0.54	1.00	−0.39	0.74	−0.40	0.73	−0.26	0.95	−0.26	0.95
Shortage of educational material	−0.35	0.95	−0.35	0.95	0.33	1.14	0.32	1.14	0.05	0.98	0.05	0.98	0.17	1.17	0.17	1.17	−0.37	0.80	−0.37	0.80
Extra-curricular activities at school	2.29	0.73	2.28	0.73	1.75	0.99	1.76	0.99	1.39	0.98	1.39	0.98	1.12	0.92	1.13	0.91	2.69	0.71	2.69	0.71
Help with homework by school teachers	0.68		0.68		0.67		0.67		0.55		0.56		0.36		0.37		0.91		0.91	
Number of obs.	1588		1581		1059		1041		1242		1252		1431		1418		1194		1188	

Source: Authors' elaboration.

Table 5
Results of the multilevel regression estimation by country (only the estimated coefficients are shown).

	Australia		Belgium (Flemish)		Brazil		Canada		Chile	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
FINANCIAL VARIABLES OF LEVEL 1 (STUDENT VARIABLES)										
<i>Student's financial socialization</i>										
Parental socialization 01	r.c.		r.c.		r.c.		r.c.		r.c.	
Parental socialization 02	9.561**		6.956		10.673		4.116		7.643	
Parental socialization 03	16.000**		8.927		11.541		4.047		9.414*	
Parental socialization 04	9.046**		18.435**		20.842**		14.281		7.698	
<i>Student's financial behavior</i>										
Saving and borrowing habits	9.649**		5.872		24.949**		12.470**		6.433	
<i>Student's financial inclusion</i>										
Owning a bank account		10.927**		13.175**		-3.909		10.723*		3.993
CONTROL VARIABLES OF LEVEL 1 (STUDENT VARIABLES)										
Expected years of education: Lower secondary education	-11.290**	-13.762**	-69.965**	-64.765**	-19.323	-20.138	-17.739	-16.761	25.728	29.998
Expected years of education: Upper secondary education	r.c.	r.c.	r.c.	r.c.	r.c.	r.c.	r.c.	r.c.	r.c.	r.c.
Expected years of education: Tertiary secondary education	15.512**	15.728**	6.887	6.660	16.440**	16.257**	3.253	5.013	6.496	5.509
Sense of belonging	-0.054	-0.041	1.265	1.819	4.213	4.336	1.279	1.635	1.174	1.975
Achievement motivation	-0.019	-0.073	-1.810	-0.931	2.640	3.566	2.382	2.835	1.179	1.858
Mathematics performance in PISA 2015	0.473**	0.478**	0.419**	0.413**	0.299**	0.302**	0.531**	0.517**	0.429**	0.441**
Reading performance in PISA 2015	0.515**	0.516**	0.427**	0.429**	0.405**	0.419**	0.456**	0.464**	0.485**	0.489**
Age	10.815**	9.022**	10.728*	9.326	8.938	3.991	2.730	2.961	-0.218	-0.637
Gender (female = 1)	-4.210**	-4.074**	3.400	2.426	-8.143	-4.219	-3.598	-4.691	2.171	2.010
Immigrant vs. native	-6.502**	-6.173**	-11.849	-13.429	-21.916	-24.029	-8.281*	-7.431	-14.196	-17.351
Grade repetition	-0.865	-1.181	-12.316**	-13.618**	-7.257	-8.731	-13.942	-11.928	-6.737	-6.472
Index of Educational, Social and Cultural Status	4.733**	4.493**	7.806**	6.032**	4.527	5.604	1.896	0.769	3.481	2.207
Information and communication technology resources	-0.168	-0.178	0.759	1.163	-1.194	-1.946	3.243	3.702	0.828	1.346
CONTROL VARIABLES OF LEVEL 2 (SCHOOL VARIABLES)										
The average class size	-0.222	-0.128	0.455	0.379	-0.551	-0.457	-0.410	-0.357	0.018	-0.022
School responsibility on curriculum and assessment	0.000**	0.000**	-1.742	-1.181	6.715	8.423*	-3.649	-1.687	0.163	-0.483
Shortage of educational material	0.091	0.085	0.588	1.225	-5.617	-6.453	3.290	2.818	0.515	-0.104
Extra-curricular activities at school	0.000	0.000	3.540	4.014*	2.008	1.812	2.008	2.254	0.359	-0.174
Help with homework by school teachers	-5.419	-5.763	-1.697	-2.905	-3.756	-3.758	5.623	5.231	-0.529	-0.237
<i>Constant</i>	-172.124**	-140.597**	-90.688	-62.473	-40.948	50.239	-36.670	-33.298	20.680	32.270
sd(cons)	19.117**	19.388**	12.486**	12.769**	38.734**	43.152**	25.140**	25.240**	17.902**	18.522**
sd(Residual)	58.703**	59.022**	49.355**	49.426**	57.821**	59.100**	55.809**	56.121**	49.667**	49.940**
Imputations	10	10	10	10	10	10	10	10	10	10
Number of obs.	9287	9339	987	979	1131	1118	2532	2528	1401	1393
Number of groups	653	654	143	143	377	370	395	393	202	202
F statistic	570.73	666.66	81.10	88.17	30.67	36.84	63.61	69.51	69.37	81.48
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FINANCIAL VARIABLES OF LEVEL 1 (STUDENT VARIABLES)										
<i>Student's financial socialization</i>										
Parental socialization 01	r.c.		r.c.		r.c.		r.c.		r.c.	
Parental socialization 02	4.297		11.983		5.545		11.103		-1.211	
Parental socialization 03	-0.768		10.837		14.556**		22.016**		5.060	
Parental socialization 04	-4.901		13.352		17.805**		18.360*		4.570	
<i>Student's financial behavior</i>										
Saving and borrowing habits	2.198		-5.128		19.890**		11.810**		10.004*	

(continued on next page)

Table 5 (continued)

	China		Italy		Lithuania		Netherlands		Peru	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
<i>Student's financial inclusion</i>										
Owning a bank account	-9.183	-3.609	-28.003	-16.101	-8.640	-1.431	1.920	13.883	-19.592	-12.767**
<i>CONTROL VARIABLES OF LEVEL 1 (STUDENT VARIABLES)</i>										
Expected years of education: Lower secondary education	10.960**	11.507**	7.710	8.301	8.815	11.847*	12.977**	13.568**	8.967*	10.882**
Expected years of education: Upper secondary education	-3.427	-3.454	0.831	0.638	1.137	1.363	1.131	1.009	5.912**	6.773**
Sense of belonging	2.559	2.473	-0.181	1.569	-1.196	-1.014	2.221	2.374	1.272	1.320
Achievement motivation	0.425**	0.429**	0.336**	0.328**	0.351**	0.342**	0.461**	0.459**	0.364**	0.372**
Mathematics performance in PISA 2015	0.440**	0.441**	0.377**	0.375**	0.427**	0.449**	0.542**	0.540**	0.577**	0.569**
Reading performance in PISA 2015	-0.615	-0.876	0.118	0.890	-2.823	-0.974	17.173*	15.296	3.379	4.301
Age	-12.294**	-11.747**	-8.352	-9.364	2.352	4.106	3.162	-2.094	-4.300	-3.362
Gender (female = 1)	-38.172	-40.663**	9.653	9.942	-14.619	-10.371	-6.587	-6.587	31.617*	30.770
Immigrant vs. native	*									
Grade repetition	-11.142**	11.073**	-3.927	-6.472	-7.662	-16.392	8.203	-7.646	-5.272	-7.916
Index of Educational, Social and Cultural Status	2.682	2.745	-5.149	-4.608	-2.199	-2.738	3.001	3.178	0.695	0.202
Information and communication technology resources	1.413	1.188	0.270	0.146	-0.494	-0.348	4.240	3.646	-2.438	-2.391
<i>CONTROL VARIABLES OF LEVEL 2 (SCHOOL VARIABLES)</i>										
The average class size	0.265	0.244	0.473	0.442	0.816	0.824	0.312	0.474	0.723**	0.839**
School responsibility on curriculum and assessment	-3.987	-3.684	-0.462	-0.213	-2.359	-2.854	-5.335	-4.618	3.796	4.476
Shortage of educational material	-1.808	-2.102	2.416	2.650	2.458	2.559	-0.017	0.093	-1.898	-2.063
Extra-curricular activities at school	-1.775	-1.472	-3.372	-2.887	0.910	0.596	-0.730	-0.418	2.478	2.534
Help with homework by school teachers	5.392	4.547	15.841**	15.802*	13.304**	13.447**	6.323	5.946	-4.973	-4.869
Constant	121.892	128.048	119.136	117.509	64.122	49.812	-295.877**	-260.829*	-75.077	-53.219
sd(cons)	23.269**	23.180**	20.778**	20.982**	27.433**	29.033**	11.480**	13.420**	16.928**	17.417**
sd(Residual)	49.912**	50.317**	48.779**	49.180**	49.678**	50.910**	51.887**	52.454**	47.912**	47.662**
Inputations	10	10	10	10	10	10	10	10	10	10
Number of obs.	2328	2315	576	567	1495	1499	779	780	923	865
Number of groups	260	260	126	126	290	289	106	106	237	230
F statistic	75.81	82.15	27.00	29.26	54.33	66.86	83.06	86.90	61.64	77.10
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Poland			Russian Federation		Slovak Republic		Spain		USA	
			Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
<i>FINANCIAL VARIABLES OF LEVEL 1 (STUDENT VARIABLES)</i>										
<i>Student's financial socialization</i>										
Parental socialization 01	r.c.		r.c.		r.c.		r.c.		r.c.	
Parental socialization 02	0.355		6.460		12.079*		-5.080		-5.051	
Parental socialization 03	10.200*		6.090		11.548**		1.044		-3.182	
Parental socialization 04	9.511		21.077**		8.105		1.873		-7.101	
<i>Student's financial behavior</i>										
Saving and borrowing habits	9.334**		10.389*		17.296**		16.475**		4.033	
<i>Student's financial inclusion</i>										
Owning a bank account		6.562		-0.174		-4.214		9.375**		3.449
<i>CONTROL VARIABLES OF LEVEL 1 (STUDENT VARIABLES)</i>										
Expected years of education: Lower secondary education	3.648	3.655	-17.779**	-17.926**	Omitted	Omitted	-9.562	-5.733	-60.830	-57.274
Expected years of education: Upper secondary education	r.c.	r.c.	r.c.	r.c.	Omitted	Omitted	r.c.	r.c.	r.c.	r.c.
Expected years of education: Tertiary secondary education	2.727	2.556	6.338	6.098	Omitted	Omitted	6.817	8.122	5.586	6.115
Sense of belonging	0.470	0.859	5.176**	5.653**	1.814	4.188	-1.773	-0.882	-0.562	-0.728

(continued on next page)

Table 5 (continued)

	Poland		Russian Federation		Slovak Republic		Spain		USA	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Achievement motivation	-0.667	-0.823	2.090	0.869	4.813*	4.874**	0.928	1.325	2.653	2.603
Mathematics performance in PISA 2015	0.462**	0.462**	0.368**	0.359**	0.443**	0.449**	0.450**	0.444**	0.469**	0.473**
Reading performance in PISA 2015	0.434**	0.440**	0.348**	0.361**	0.423**	0.439**	0.424**	0.439**	0.463**	0.464**
Age	13.074**	13.277**	1.177	6.176	-4.136	0.777	4.589	4.257	9.722	8.726
Gender (female = 1)	6.238*	6.579*	-8.255**	-5.669	9.375**	10.172**	1.374	1.457	-11.111**	-10.933**
Immigrant vs. native	0.032	-1.694	2.230	9.286	14.596	3.949	-0.488	-1.280	12.087*	13.469*
Grade repetition	-13.869*	-14.590*	-26.878*	-15.898	-14.003	-18.499	-8.517	*-6.075	-5.303	-4.366
Index of Educational, Social and Cultural Status	0.070	-0.467	3.138	4.454	-1.217	-2.418	-1.491	-2.010	4.973*	4.396
Information and communication technology resources	0.867	0.916	-5.855*	-5.449	-1.848	-0.806	3.592	3.996	1.637	1.724
CONTROL VARIABLES OF LEVEL 2 (SCHOOL VARIABLES)										
The average class size	0.233	0.272	1.054	1.125*	0.816	0.504	0.284	0.224	0.320	0.326
School responsibility on curriculum and assessment	-1.256	-1.242	1.688	1.159	3.201	1.653	1.421	0.349	1.364	1.292
Shortage of educational material	-2.376	-2.690	-0.071	-0.904	8.446**	8.902**	0.905	1.164	-6.426**	-6.581**
Extra-curricular activities at school	-5.222	-4.586	-1.447	-0.792	-3.281	-4.988	-1.675	-1.538	-0.810	-1.209
Help with homework by school teachers	4.034	4.385	-7.281	-6.445	-10.004	-12.041	-1.684	-1.004	-12.879	-12.463
Constant	-184.640*	-184.855*	106.522	37.104	74.672	17.523	-49.073	-45.681	-112.231	-101.619
sd(cons)	24.677**	25.983**	21.399**	20.196**	33.587**	36.515**	24.705**	26.048**	17.405**	17.370**
sd(Residual)	53.258**	53.857**	51.107**	52.272**	60.181**	60.659**	50.709**	50.811**	47.255**	47.474**
Imputations	10	10	10	10	10	10	10	10	10	10
Number of obs.	1588	1581	1059	1041	1242	1252	1431	1418	1194	1188
Number of groups	157	15	185	185	256	257	187	186	166	166
F statistic	94.99	111.38	36.00	38.56	67.27	66.58	79.20	93.59	100.93	116.81
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Dependent variable: financial literacy scores (10 plausible values) for each student. The estimate has been made taking into account the relevant weights. r.c.: reference category. Omitted: variable not considered due to the absence of observations in that category. **/* Significant at the 5%/10% level of significance, respectively.

Source: Authors' estimations.

non-repeater in Belgium, China, Poland, Russia, and Spain. The negative sign of grade repetition has also been found by [Greene and Winters \(2007\)](#) and [Morrison and On No \(2007\)](#). It is important to reflect upon policies of repetition and on the appropriateness of extending school support programs to pupils with educational difficulties as an effective alternative to grade repetition educational policy.

Finally, students' performance in financial literacy is associated with their expectations for their future. In particular, in Australia, Brazil, China, Lithuania, the Netherlands, and Peru, there is a positive association between performance in financial literacy and expectations of students to pursue tertiary education, even including in the regression other individual and school variables.²⁷ But it may also be the case that students with higher financial literacy may attribute more value to investing in their human capital ([Pesando, 2018](#)). However, PISA data do not allow for establishing causal relationships, but they can be used to describe the association between performance in financial literacy and students' expectations for their future ([OECD, 2017a](#)).

4.2.4. Has financial inclusion a causal, positive influence on financial literacy?

In Model 2, we have focused on presenting the effect of students' financial inclusion – measured through the use of financial services such as *Owning a bank account* – on financial literacy, after taking into account other control variables. But, financial literacy could also explain financial inclusion. For example, [Grohmann and Menkhoff \(2017\)](#) found that countries with higher financial literacy also have a higher degree of financial inclusion. The bilateral relationship *financial literacy-financial inclusion* causes the econometric problem known as endogeneity.²⁸ To test if there is a causal effect of financial inclusion on financial literacy we use the Hausman test ([Hausman, 1978](#)).²⁹ This test requires the use of instruments or instrumental variables (IV). Therefore, we must verify first the adequacy of the instruments ([Salas-Velasco, 2006](#)): a) their validity (instrumental variables are not related to the dependent variable); and b) its quality (there is a strong correlation between the instrumental variables and the endogenous variable). Once the instruments are chosen, the Hausman test ([Hausman, 1978](#)) requires the following steps ([Salas-Velasco, 2006](#)): 1) the endogenous variable should be regressed on the instrumental variables and the rest of the independent variables, and save the predicted residuals; 2) the outcome variable (dependent variable) should then be regressed on all independent variables and predicted residuals. The significance of residuals at 5% would indicate endogeneity.

We use the Hausman test ([Hausman, 1978](#)) to check for the potential endogeneity of the variable *Owning a bank account*.³⁰ We use as an instrumental variable the dichotomous variable *Saving habit*, which takes the value of 1 if the student has a habit of saving, and take the 0 value in another case.³¹ Once it has been verified that our instrumental variable fulfilled conditions a) and b), we proceed to the implementation of the Hausman test ([Hausman, 1978](#)) following the steps 1) and 2). Only in Australia, financial inclusion did turn out finally to be an endogenous variable (see Appendix I).³² Therefore, the results shown in the previous section could be considered correct from the econometric

point of view for Belgium, Canada, and Spain. In short, financial inclusion has a causal, positive influence on financial literacy in these countries. In the case of Australia, we reported that instrumenting greatly enhanced the measured positive impact of financial inclusion on financial literacy. The estimation using instrumental variables of the multilevel regression showed that the coefficient associated with the variable *Owning a bank account* was greater: 33 versus 11 points ([Table 9](#) in Appendix I and [Table 5](#), respectively). It seems clear that the non-instrumented estimates of financial inclusion may underestimate the true effect on financial literacy. In other words, and as expected, endogeneity biases downward the true marginal effect exerted by an explanatory variable on the variable to be explained.

4.3. What do our results mean for policy?

The current issue of financial literacy is addressed at the international level, and the findings suggest that increasing the level of financial knowledge of youth can be more than useful. On the one hand, financial literacy benefits individuals and households, since they can make better and more informed decisions. On the other hand, there are also benefits that society can reap from financially literate citizens. In any case, there is still a question to be answered: what kinds of “targeted policies” would be both helpful and feasible – and who would they target? Levels of financial literacy can be improved through formal financial education (through instruction) as well as within the context of the family (through information). Financial literacy inequalities inside the schools could be reduced by ensuring that formal education systems:

- Strengthen performance in math and reading.
- Provide equal opportunities for learning to boys and girls.
- Address the needs of low performing students.
- Target groups that are most at-risk for being economically disadvantaged and likely with the least financial knowledge such as immigrants and inner-city students.

But much of socialization, in general – and, thus, financial socialization, as well —, occurs within the context of the family. Parents appear to play a vital role in passing young people with safe opportunities to learn by experience outside of schools. So, financial education initiatives targeting parents at the same time as young people by delivering standardized information and comparison tools for financial products would also be desirable.

5. Conclusion

Understanding how to manage money well remains a key life skill that is required for all aspects of adult life. Policymakers increasingly perceive the development of financial skills among young people as essential. The results of our research are therefore relevant for their implications for educational policy. First, parental engagement in their children's financial socialization remains key. The results show that students who have the chance to talk to their parents about money also tend to get higher scores in financial literacy. But not all students can learn equally from their families. Targeted policies are necessary to complement parental advice and place all students on an equal footing. Second, students' financial literacy is positively associated with understanding the value of saving. Most students would save if they want to buy something for which they do not have enough money. Finally, in some countries, exposure to and the use of financial products also improve students' knowledge and skills. In particular, students who hold a bank account perform better in financial literacy than students of similar socio-economic status who do not have a bank account. So, promoting savings habits and giving access to financial services from a young age can provide students with opportunities to learn by experience.

²⁷ Although there is a correlation between expected years of education and family socioeconomic status, it is moderate in all the countries analyzed.

²⁸ A natural question to ask is whether a variable presumed to be endogenous in the previously fit (Model 2) could instead be treated as exogenous.

²⁹ Relatively few empirical analysts have accounted for the potential endogeneity in this context. These works are summarized in [Lusardi and Mitchell \(2014\)](#).

³⁰ We understand that the other two financial variables included in Model 1 – how children are financially socialized by their parents and understanding the value of saving – have an exogenous character.

³¹ See Annex I with more details of the coding of this variable.

³² The results of the Hausman test for Belgium, Canada, and Spain can be requested from the authors upon request.

Conflict of interest

The authors declare that they have no conflicts of interest.

Appendix A. The issue of endogeneity: The case of Australia

For an excluded exogenous variable to be a valid instrument, it must be sufficiently correlated with the included endogenous regressor but uncorrelated with the error term: conditions b) and a) respectively. We chose as an instrument the variable *Saving habit* which was defined as a binary variable that takes the value 1 if the student answered:

- a) I save the same amount of Money each week or month,
- b) I save some Money each week or month, but the amount varies,
- c) I save Money only when I have some to spare,
- d) I save Money only when I want to buy something,

to the question “Which of these statements about saving money best applies to you?”

The variable takes the value 0 if s/he it answered:

“I do not save any money” including “I have no money so I do not save.”

- a) Checking the validity of the instrumental variable.

We tested the validity of the instrument by regressing the financial Literacy scores on *Saving habit* and the rest of the explanatory variables. The estimated coefficient associated with *Saving habit* was not statistically significant at the 5% level (Table 6).

Table 6
Checking the validity of the instrument (*Saving habit*) for Australia (only the estimated coefficients are shown).

<i>Instrumental variable</i>	
Saving habit	5.602
<i>CONTROL VARIABLES OF LEVEL 1 (STUDENT VARIABLES)</i>	
Expected years of education: Lower secondary education	–13.206**
Expected years of education: Upper secondary education	
Expected years of education: Tertiary secondary education	16.211**
Sense of belonging	–0.060
Achievement motivation	0.042
Mathematics performance in PISA 2015	0.476**
Reading performance in PISA 2015	0.517**
Age	10.318**
Gender (female = 1)	–3.826**
Immigrant vs. native	–7.059**
Grade repetition	–1.634
Index of Educational, Social and Cultural Status	5.127**
Information and communication technology resources	–0.161
<i>CONTROL VARIABLES OF LEVEL 2 (SCHOOL VARIABLES)</i>	
The average class size	–0.180
School responsibility on curriculum and assessment	0.000**
Shortage of educational material	0.091
Extra-curricular activities at school	0.000
Help with homework by school teachers	–5.561
Constant	–156.280**
sd(cons)	19.710**
sd(Residual)	59.149**
Imputations	10
Number of obs.	9200
Number of groups	654
F statistic	639.43
Prob > F	0.000

Dependent variable: financial literacy scores (10 plausible values) for each student. The estimate has been made taking into account the relevant weights. r.c.: reference category.

Source: Authors' estimations.

** Significant at the 5% level of significance.

- b) Checking the quality of the instrumental variable.

To test the quality of the instrumental variable chosen, we regressed the variable *Owning a bank account* on the variable *Saving habit* and the rest of the explanatory variables. The estimated coefficient associated with *Saving habit* was statistically significant at the 5% level (Table 7), so this variable would be a good instrument. In this case, given that the dependent variable was dichotomous (having or not a bank account), the estimated model was a multilevel binary logistic model. Hence, having a habit of saving increases the probability of having a bank account, but it does not

affect directly to the financial literacy scores.

Table 7

Checking the quality of the instrument (*Saving habit*) for Australia (only the estimated coefficients are shown).

<i>INSTRUMENTAL VARIABLE</i>	
Saving habit	0.941**
<i>CONTROL VARIABLES OF LEVEL 1 (STUDENT VARIABLES)</i>	
Expected years of education: Lower secondary education	– 0.029
Expected years of education: Upper secondary education	
Expected years of education: Tertiary secondary education	0.206**
Sense of belonging	– 0.003
Achievement motivation	0.009
Mathematics performance in PISA 2015	0.002**
Reading performance in PISA 2015	– 0.001*
Age	0.833**
Gender (female = 1)	0.229**
Immigrant vs. native	– 0.680**
Grade repetition	0.124
Index of Educational, Social and Cultural Status	0.322**
Information and communication technology resources	0.001
<i>CONTROL VARIABLES OF LEVEL 2 (SCHOOL VARIABLES)</i>	
The average class size	– 0.018**
School responsibility on curriculum and assessment	0.000**
Shortage of educational material	0.002
Extra-curricular activities at school	0.000**
Help with homework by school teachers	– 0.002
Constant	– 12.574**
sd(cons)	1.395**
Number of obs.	9098
Number of groups	654
Wald chi2(18)	285.78
Log pseudolikelihood	– 188,900,000.0
Prob > chi2	0.000

Dependent variable: *Owning a bank account*. The estimate has been made taking into account the relevant weights. r.c.: reference category. **/* Significant at the 5%/10% level of significance, respectively.

Source: Authors' estimations.

Once it was verified that our instrument satisfied conditions a) and b), we proceeded to the implementation of the Hausman test (1978) following the steps 1) and 2).

- 1) The endogenous variable *Owning a bank account* was regressed on the instrumental variable and the rest of the independent or explanatory variables, and we saved the predicted residuals.³³
- 2) The dependent variable (financial literacy scores) was then regressed on all independent variables and the predicted residuals. The significance of residuals at the 5% level indicated endogeneity (Table 8).³⁴

Table 8

Hausman test (1978) for Australia (only the estimated coefficients are shown).

Predicted residuals	24.546**
<i>FINANCIAL VARIABLES OF LEVEL 1 (STUDENT VARIABLES)¹⁾</i>	
<i>Student's financial inclusion</i>	
Owning a bank account	9.356**
<i>CONTROL VARIABLES OF LEVEL 1 (STUDENT VARIABLES)</i>	
Expected years of education: Lower secondary education	– 13.893**
Expected years of education: Upper secondary education	
Expected years of education: Tertiary secondary education	15.212**
Sense of belonging	– 0.047
Achievement motivation	– 0.013
Mathematics performance in PISA 2015	0.467**
Reading performance in PISA 2015	0.519**
Age	6.562**
Gender (female = 1)	– 4.976**
Immigrant vs. native	– 3.139
Grade repetition	– 1.796
Index of Educational, Social and Cultural Status	3.244**

(continued on next page)

³³ Predicted residuals of the estimation shown in Table 7.

³⁴ The problem of endogeneity is ultimately a problem of sample self-selection.

Table 8 (continued)

Information and communication technology resources	– 0.170
<i>CONTROL VARIABLES OF LEVEL 2 (SCHOOL VARIABLES)</i>	
The average class size	– 0.124
School responsibility on curriculum and assessment	0.000**
Shortage of educational material	0.072
Extra-curricular activities at school	0.000
Help with homework by school teachers	– 5.693
Constant	– 115.243**
sd(cons)	19.012**
sd(Residual)	58.953**
Imputations	10
Number of obs.	9098
Number of groups	654
F statistic	624.570
Prob > F	0.000

Dependent variable: financial literacy scores (10 plausible values) for each student. The estimate has been made taking into account the relevant weights. r.c.: reference category.

Source: Authors' estimations.

** Significant at the 5% level of significance.

After checking that the variable *Owning a bank account* was endogenous, we estimated the multilevel model using, instead of the endogenous variable, the probabilities predicted from the estimation shown in Table 7 following Barnow, Cain, and Goldberger (1980). Table 9 showed the results. As we already indicated, the non-correction by endogeneity yields estimated coefficients that are biased (and inconsistent).

Table 9

Instrumental variables (IV) estimation to assess the impact of financial inclusion on financial literacy: The case of Australia (only the estimated coefficients are shown).

Predicted probabilities	33.357**
<i>CONTROL VARIABLES OF LEVEL 1 (STUDENT VARIABLES)</i>	
Expected years of education: Lower secondary education	– 12.982**
Expected years of education: Upper secondary education	
Expected years of education: Tertiary secondary education	15.314**
Sense of belonging	– 0.052
Achievement motivation	0.010
Mathematics performance in PISA 2015	0.466**
Reading performance in PISA 2015	0.522**
Age	6.557**
Gender (female = 1)	– 4.896**
Immigrant vs. native	– 3.060
Grade repetition	– 2.061
Index of Educational, Social and Cultural Status	3.375**
Information and communication technology resources	– 0.158
<i>CONTROL VARIABLES OF LEVEL 2 (SCHOOL VARIABLES)</i>	
The average class size	– 0.132
School responsibility on curriculum and assessment	0.000**
Shortage of educational material	0.077
Extra-curricular activities at school	0.000
Help with homework by school teachers	– 5.252
Constant	– 116.334**
sd(cons)	19.223**
sd(Residual)	59.156**
Imputations	10
Number of obs.	9200
Number of groups	654
F statistic	654.90
Prob > F	0.000

Dependent variable: financial literacy scores (10 plausible values) for each student. The estimate has been made taking into account the relevant weights. r.c.: reference category.

Source: Authors' estimations.

** Significant at the 5% level of significance.

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