APPLIED ECONOMICS
2019, VOL. 51, NO. 16, 1679–1693
https://doi.org/10.1080/00036846.2018.1528336

Routledge
Taylor & Francis Group

The effect of financial education training on the financial literacy of Spanish students in PISA

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ABSTRACT

The aim of this paper is to analyze the effect of financial education training on Spanish secondary students. To do this, we rely on data from PISA 2012. This included an assessment of students' financial literacy for the first time. In order to identify the causal effect of financial education courses, we employ a difference-in-differences (DiD) approach to compare the outcomes of students receiving and not receiving education on financial concepts for two different subjects (financial literacy and reading comprehension). Our results suggest that financial education programs only have an impact if they are taught as part of other subjects, i.e. by means of a cross-curricular approach.

KEYWORDS

Education; financial literacy; PISA; difference-in-differences

JEL CLASSIFICATION

I21; H52; C13

I. Introduction

The outbreak of the international financial and economic crisis in 2008 led to a process of collective reflection on the social and ethical implications of financial transactions and, particularly, the inability of many citizens to make sound financial investments (Gerardi, Goette, and Meier 2010). However, many countries had already launched initiatives to improve their population's financial literacy even before the advent of the crisis (Appleyard and Rowlingson 2013). Many of these programs date back to the 2005 OECD Council Resolution recommending member states to educate their citizens with respect to financial issues at all stages of their life, not only for their own personal wellbeing but also for the good of the economy and society as a whole (Gnan, Silgoner, and Weber 2007; Stango and Zinman 2009; Lusardi and Mitchell 2007).

This paper focuses on initiatives of this kind targeting young people, since they have proved to have more limited financial knowledge (Mandell 2008; Shim et al. 2010; Lusardi and Mitchell 2007). Moreover, they will have to deal with increasingly complex financial products, services and markets when they reach adulthood (OECD 2014a). Such programs play a preventive role, thus they should be applied in a generalized way, using different teaching methods to courses designed for adults that normally target specific segments of the population primarily for the purpose of correcting bad money management habits (Lusardi and Mitchell 2014).

By now, many countries have developed different national initiatives designed to adopt financial education (FE) in their education systems to ensure access for the entire school-age population. FE has taken different forms depending on the countries and different models may even coexist within the same country. This leads to major deviations between schools and regions.[1] They range from special-purpose courses taught by teachers from outside the teaching institutions (normally specialists from financial institutions) to special finance-related subjects or contents that are adopted within subject syllabuses as part of the school curriculum.

In Spain, until very recently, there has been no specific subject with economic or financial content in either primary or compulsory secondary education. Actually, when the PISA 2012 survey was conducted, financial contents were only taught in some schools adopting a cross-curricular approach

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[1] In recent years, a number of OECD researchers have developed several papers giving an overview of the level of development of FE strategies in the international arena (Grifoni and Messy 2012; Atkinson and Messy, 2013; Messy and Monticone 2012, 2016).

in courses such as Social Sciences, Geography or History, i.e. adopting a more historical or geographical point of view. In fact, Spain was the country with the lowest percentage of schools at which this type of education was available in 2012, as we can see at Figure 1, which shows the percentage of schools offering some sort of FE as part of the school curriculum in the 18 countries that participated in the test on financial literacy in PISA 2012.[2]

Several measures have recently been taken to reverse this situation. The first was the development of a pilot FE program called *Finanzas para todos* (Finance for All), coordinated by the Bank of Spain and the Spanish National Stock Market Commission in 2010. This program started in during the academic year 2010/2011 (and continued also in 2011/2012) for 15 year-old students and involved the cross-curricular integration of contents related to financial issues into social science, mathematics and civic education taught in the third year of compulsory secondary education (ESO) as well as the implementation of some specific courses about financial concepts in some specific regions across the Spanish territory (Andalusia, Castile and Leon, Madrid, Murcia and Navarre). Later, with the implementation of the LOMCE (Basic Law 8/2013, of 9 December, for the Improvement of Educational Quality), financial education became part of the primary and secondary education curriculum in the school year 2014/2015. In primary education, FE started to be taught as part of social science, addressing basic concepts concerning the value of money, saving, personal budgeting and responsible and sustainable consumption. On the other hand, secondary education includes specific subjects addressing FE like economics and introductory entrepreneurship and business activity, as well as adopting a cross-curricular approach whereby financial contents are included in other subject syllabuses.

In this paper, we attempt to examine whether providing some form of financial education is an effective practice for improving young students' financial literacy. Likewise, we also explore the effectiveness of different types of teaching strategies. For this purpose, we use data from the OECD's Programme for International Student Assessment (PISA), which included a module on financial literacy for the first time in 2012. The assessment provides comparable information with regard to the financial literacy of 15-year-old students by testing how well they apply their knowledge in everyday life situations. The dataset also includes extensive information about individual characteristics, socioeconomic background and school contexts. In this manner, the analysis can account for these factors.

One of the main concerns about using observational data from PISA is that omitted variables and selection bias are hard to account for when assessing the relationship between financial education programs and financial outcomes (Fox, Bartholomae,

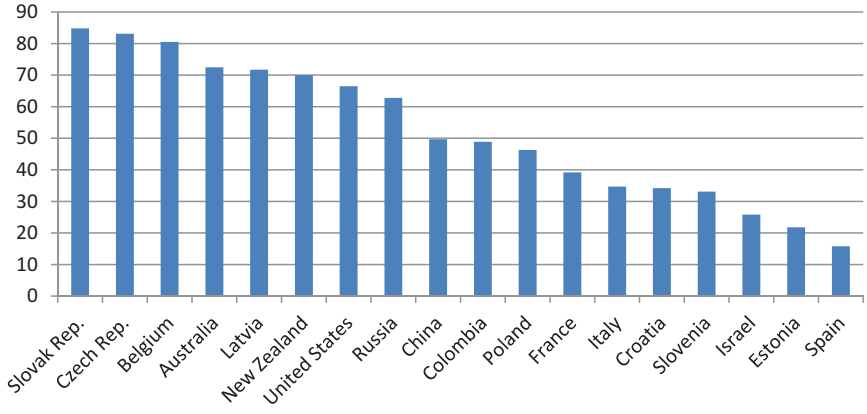

Figure 1. Schools offering FE in countries participating in PISA 2012.
Source: OECD (2014a, p.148).

[2]This information was taken from a questionnaire completed by the principals of the participant teaching institutions who were asked whether FE was available at their schools.

and Lee 2005). For instance, the lack of information about students' cognitive abilities, which could possibly be correlated with other potential explanatory variables, as well as having an influence on financial learning, could bias the estimation of the causal effect of financial education. To avoid this problem, our estimation strategy involves using a difference-in-differences (DiD) approach comparing the results achieved by the same students for two different subjects (differences between financial literacy and reading comprehension), as suggested by Jürges, Schneider, and Büchel (2005). The main advantage of this approach is that we use each student as his or her control group in order to control for most of the heterogeneity at the individual level represented by innate abilities. The key assumption required to identify the causal effect is that the difference in both outcome variables should be identical at schools not offering financial education. Therefore, the difference in excess of the financial literacy test at schools offering financial education courses should reflect its impact.

The rest of the paper is structured as follows. Section 2 provides a brief literature review about the importance of financial education and its effects on student outcomes. Section 3 explains the adopted estimation strategy. Section 4 provides a description of the dataset and the variables considered in our empirical analysis, and Section 5 reports the main results. Finally, Section 6 outlines our main conclusions.

II. Literature review

As more and more programs and initiatives aimed at improving the population's financial literacy are set up, literature has grown up around the evaluation of their effectiveness (McCormick 2009). The assessment of those programs is a complex task, since it requires access to information about the characteristics of individuals that have and have not participated in such initiatives in order to ascertain their real impact. In fact, as Lusardi and Mitchell (2014) claim, there are few empirical studies reporting meaningful evaluations of the impact of FE programs on the behavior of individuals.

Before reviewing this literature, it is important to make a distinction between some interconnected concepts in order to gain a better understanding of the effects attributable to financial education programs (Fox, Bartholomae, and Lee 2005). Financial education refers to the process of providing individuals with information or instruction to improve their understanding of financial products, develop their skills with regard to their awareness of risk and opportunities, making informed choices and taking effective actions for their financial wellbeing (OECD 2005). Financial literacy can be interpreted as knowledge of the financial system, the ability to understand key financial concepts related to the management of money, loans and investment in different assets or both (Hung, Parker, and Yoong 2009; Xu and Zia 2012). Finally, financial outcomes refer to the skills and behaviors regarding how people deal with financial matters such as saving or participating in the stock market (Hastings, Madrian, and Skimmyhorn 2013).

Recent literature has shown that FE has positive effects on the development of certain behaviors, such as saving for retirement (Lusardi and Mitchell 2007; Cole, Sampson, and Zia 2011; Xu and Zia 2012) or contracting mortgages and loans with lower interest rates and commissions (Disney and Gathergood 2013; Lusardi and Tufano 2015). Additionally, there is evidence demonstrating that the acquisition of financial knowledge is associated with a wide range of behaviors such as participation in the stock market, portfolio diversification or the tendency to avoid over-indebtedness (Guiso and Jappelli 2002; Christelis, Jappelli, and Padula 2010; Van Rooij, Lusardi, and Alessie 2011; Lusardi and Tufano 2015).

Nevertheless, a recent extensive meta-analysis conducted by Fernandes, Lynch Jr, and Netemeyer (2014), clearly separating studies focused on correlation (e.g. using OLS) from others using causal designs (experimental design or natural experiments), concludes that financial education interventions have hardly any aggregate effect on improving financial literacy. Actually, they found much larger effects in non-experimental studies applying a less rigorous econometric method. The findings of the literature review carried out by Miller et al. (2015) are similar, since most of the analyzed papers have positive outcomes for financial education, but many suffer from selection bias or other econometric concerns. Their explanation for these results is that the

inflated effect detected in the analyzed studies might mask a problem of omitted-variable bias, since there are some underlying factors that have not been taken into account (e.g. innate abilities or interest in financial matters) and might contribute to both higher levels of financial literacy and better financial outcomes. Some previous papers have tried to deal with this issue. However, we were unable to identify a convincing identification strategy with the available data, and thus there are still some unresolved issues.

As already discussed, in this paper we focus on the analysis of the effectiveness of educational programs targeting secondary education students. Therefore, we are concerned with exploring the relationship between FE and the acquisition of financial knowledge or financial culture. With regard to this issue, almost all the studies evaluating the effectiveness of such programs, most of which refer to the United States of America (Bernheim, Garrett, and Maki 2001; Tennyson and Nguyen 2001), reveal that they have a positive impact on students' financial knowledge (Swinton et al. 2007; Batty, Collins, and Odders-White 2015), although its relevance varies depending on the type of course taught and the characteristics of the students attending the course (Walstad 2013). However, other papers suggest that the effect of such courses is negligible (Peng et al. 2007; Mandell and Klein 2009).

Following the trend initiated in the United States, where high school financial education mandates have been enacted in many states over the past fifty years, other countries have created financial education programs in recent years and assessed their effectiveness. For example, an experimental program for adopting FE in the Italian school curriculum had a positive effect on the students' knowledge, even one year after completing the program (Romagnoli and Trifilidis 2013). Becchetti, Caiazza, and Coviello (2013) reached a similar conclusion when analyzing a 16-hour course deployed at another set of schools in Italy. With respect to Germany, Lührmann, Serra-Garcia, and Winter (2015) also found that teaching a specific course on FE in secondary schools helped to improve knowledge of finance. Other papers refer to South America. For example, Bruhn et al. (2013) studied the case of several Brazilian schools that voluntarily decided to teach a FE course with a very positive effect on student knowledge. Finally, some FE programs established in much poorer countries have been evaluated in recent years. For instance, Berry, Karlan, and Pradhan (2015) also identified positive effects for two different FE programs deployed in primary and secondary education in Ghana, and Jamison, Karlan, and Zinman (2014) observed in Uganda that the deployment of a 10-week course on different issues related to FE had a favorable impact on student behavior, whereas the alternative of giving them a bank account to manage had no significant effect.

The only evaluation of the effectiveness of FE programs in Spain refers to the *Finance for All* pilot program at a sample of teaching institutions within the Autonomous Community of Madrid, which was found to be quite effective (Hospido, Villanueva, and Zamarro 2015). In particular, after correcting for the differences in the composition of the students attending the schools that taught FE contents with respect to schools that did not,[3] the results in the test of financial knowledge achieved by the former were a third of standard deviation greater than for the latter.

III. Empirical strategy

The evidence provided by the studies that aim to evaluate the effectiveness of FE programs is based on experiments where there is some homogeneity with respect to the characteristics of the schools that do and do not teach the programs. This reduces the possibility of selection bias of the sample between the treatment and control groups (Duflo, Glennerster, and Kremer 2007). The golden rule of experimental evaluation therefore holds (Collins and O'Rourke 2010), and the outcomes achieved by individuals that have and have not received financial education are comparable.

However, experimental information is seldom available, thus the impact of these programs is normally evaluated based on the analysis of

[3]To guarantee the homogeneity between the treatment group (students that attended the course) and the control group (students that did not attend the course), the authors applied matching techniques to pair students with similar observable characteristics belonging to each sample.

observed data, where, as there is no previous randomization, the individuals in the two groups that are compared may have different characteristics. In these cases, the validity of the evaluations is questionable unless suitable econometric methods are employed to correct the common problem of endogeneity in data (Fox, Bartholomae, and Lee 2005; Lyons et al. 2006; Willis 2011).[4]

This problem may arise on different grounds, such as the simultaneity between the dependent and independent variables or the omission of a key variable from the analysis. For instance, some unobserved characteristics of students such as intelligence, ability, interest in financial matters or previous experiences with money might be relevant factors in determining financial learning. Additionally, we have to consider that the assignment of students across schools might not be random when comparing schools that offer FE courses with schools that do not. For example, children from families with greater economic and cultural capital are more likely to attend schools with better resources, where this type of financial courses are more likely to be implemented. In short, some mechanism has to be established to prevent these problems and guarantee the validity of the results in order to be able to identify the effect of FE.

One common option to prevent the problem of data endogeneity is to use an instrumental variable related to the explanatory variable under analysis in order to generate an exogenous variation on the results. Bucher-Koenen and Lusardi (2011), Fornero and Monticone (2011) and Van Rooij, Lusardi, and Alessie (2011), (2012)) adopted this approach. However, the identification of an instrument that meets the requirements of this econometric approach is seldom straightforward.

In this paper we use a difference-in-differences (DiD) approach in order to address such potential sources of selection bias. This methodology is usually applied when panel data are available. It is thus possible to observe individuals in treatment and control groups at two different points in time, i.e. before and after implementing the evaluated program (Becchetti, Caiazza, and Coviello 2013). The strategy adopted consists of comparing the difference between the results of students before and after participating in the program at schools where FE is available (treatment group) with the difference in the results achieved at equivalent times by individuals from schools where no such program exists (control group) (Schlotter, Schwerdt, and Woessmann 2011). The main advantage of using this technique is that it limits any bias caused by there being non-observable differences between the evaluated subjects.

However, data about the performance of students before and after receiving FE training are not available in our case. Therefore, we have adapted this method to an alternative framework where we observe the performance of the same individuals in different subjects. This strategy was originally employed by Jürges, Schneider, and Büchel (2005) to identify the causal effect of central exams on student performance in Germany using TIMSS data. Other studies have used similar models based on student fixed effects to estimate the impact of teacher characteristics or practices on student performance (Dee 2005, 2005; Schwerdt and Wuppermann 2011, Bietenbeck 2014) or the influence of instruction time on academic achievement (Rivkin and Schiman 2015). In fact, a recent study by Cordero, Cristobal, and Santín (2017) analyzing the papers that have applied causal inference techniques on data from international databases highlights that this methodological approach is the most frequent in the literature, as it is the strategy calling for the fewest assumptions.

The underlying assumption of our estimation strategy is based on the fact that the treatment, i.e. the provision of financial training by the school, has an influence on only one dimension of student performance represented by the scores in the financial literacy test. Therefore, the control group should be represented by students attending schools where this course is not available. Since PISA provides test results for two additional competences, mathematics and reading, we can estimate DiD by subject. Later, we take advantage of the fact that we have information on the outcomes of the same student for another competence, namely reading comprehension, and we can thus

[4]For a more detailed analysis of this issue, see Hill, Griffiths, and Lim (2008).

estimate a DiD equation making a distinction between the two subjects. In particular, we selected reading comprehension outcomes for comparison in order to avoid a potential source of endogeneity between achievement in mathematics and financial literacy, since most of the questions in the financial literacy test include algebraic calculations (see OECD 2013 for details).

In this framework, the estimation strategy consists of separating the sample into students attending schools offering a FE course and students attending schools where no such course was available. The key assumption required to identify the causal effect is that the difference in the two outcome variables would be identical in the absence of treatment. Thus an excess difference in the financial literacy test at schools offering FE courses should reflect the causal effect that we are looking for.

Formally, our estimator can be described as follows. We consider two different regressions to explain the results in reading (R) and financial literacy (F):

$$y_i^R = \mu_i + X_i\beta + \varepsilon_i^R \quad (1)$$

$$y_i^F = \mu_i + X_i\gamma + FE_i\delta + \varepsilon_i^F \quad (2)$$

where μ_i is any individual specific characteristic (e.g. cognitive abilities), X_i represents a vector of covariates that might affect the performance in reading comprehension and financial literacy differently, FE_i is a dummy variable for the availability of FE courses and ε_i^K are error terms. The DiD method basically consists of a subtraction of the equations:

$$D_i = y_i^F - y_i^R = X_i(\gamma - \beta) + C_i\delta + \varepsilon_i^F - \varepsilon_i^R \quad (3)$$

where δ is our parameter of interest. The key advantage of this approach is that the use of differences removes the intrinsic characteristics of each individual (μ_i) from the equation. Thus we are able to control for most of the heterogeneity represented by innate ability or previous experience at the individual level. This means that each student is serving as his or her control group. This equation is estimated using the traditional least squares method. The interpretation of parameter $\hat{\delta}$ as the causal effect of FE courses on financial literacy performance relies on the assumption that the expected value of the difference between both error terms is null:

$$E\left[\left(\varepsilon_i^F - \varepsilon_i^R\right)\right] = 0 \quad (4)$$

This assumption would not hold if the characteristics of students attending schools offering FE courses are potentially different from the pupils of schools that do not offer such courses, i.e. if there is a self-selection bias into treatment. We do not think that this problem occurs with our dataset since parents are unlikely to decide between schools depending on whether or not they offer FE courses. In addition, in our dataset we can identify that all schools were FE courses were implemented belonged to the five regions that decided to participate in the pilot program implemented in courses 2010/2011 and 2011/2012. Therefore, the decision to participate was not taken by schools, but by the corresponding regional government, which subsequently selected randomly some schools to implement the program within their territory.

A second aim of this research is to examine whether the manner in which the financial knowledge is taught may have an influence on the financial literacy of students. In particular, we check whether the fact that these concepts are taught as part of a specific course, either extracurricularly or by means of lessons taught within school hours, or are taught adopting a cross-curricular approach, that is, as part of other subjects like mathematics or social science, has any effect. To evaluate these aspects, we estimate a multiple treatment model in which additional dichotomous variables built based on the information provided by the principals of the evaluated teaching institutions are added to Equation 3.

Both the model presented in Equation 3 and the multiple treatment models described above were estimated using the traditional least squares model (OLS), which estimates parameters associated with variables that reflect the average value of the effect of the respective variable on the conditional expectation of the dependent variable. Additionally, as a robustness check, we also estimated regressions using the semi-parametric quantile regression method (Koenker and Basset 1978). This approach allows us to estimate different lines of regression

using all the available information, thereby considering the heterogeneity of the effect of the explanatory variables on different sections of the distribution of the dependent variable (Koenker and Hallock 2001).

IV. Data and variables

Our empirical study is based on the data provided by the well-known PISA (*Programme for International Student Assessment*) survey, which evaluates the mathematics, reading and science knowledge of 15-year-old students. Financial literacy was added as a new competence in 2012. Within PISA, this competence is conceived as students' ability to apply knowledge and skills in some key areas and analyze, reason and communicate effectively as they state, solve and interpret problems in different situations. PISA focuses on young people's ability to use their knowledge and skills to respond to real-life challenges rather than just their mastery of a specific curriculum content. Although the content varies across countries, financial literacy usually includes categories such as money and transactions, planning and managing finance, risk and rewards, and an understanding of the financial landscape. These categories are illustrated by means of several open and multiple-choice questions. The PISA test developed by the OECD is designed to obtain, based on the responses to these questions, five plausible values extracted at random from the distribution of the results to approximate the level of students' financial knowledge (Wu 2005).

All 65 countries participating in PISA 2012 were given the option to evaluate students' knowledge in this field, although only 18 decided to participate in the financial knowledge test (Australia, the Flemish Community of Belgium, Colombia, Croatia, Czech Republic, Estonia, France, Israel, Italy, Latvia, New Zealand, Poland, Russia, Shanghai-China, Slovak Republic, Slovenia, Spain and United States). The sample was composed of 29,000 students accounting for a total of nine million 15-year-olds. However, our research focuses on the Spanish database, composed of a total of 1050 students from 170 schools.

The number of students whose financial literacy was evaluated does not match the total number of students participating in the main PISA test (35 per school). To be exact, only eight students from each selected school participated in the financial knowledge test. These pupils also answered the questions on mathematics and reading comprehension. Additionally, these students answered a questionnaire on different issues related to their motivations, their family background and their learning strategies. Although the volume of available information is very broad, in our empirical analysis we opted to select only some factors that had been reported in the background literature to have an important impact on educational achievement, like student gender, immigrant status, preschool attendance, parents' educational level and job qualifications, and number of books available in the household.

On the other hand, school principals completed a questionnaire on school resources, learning environment and the presence of FE. Based on this information, we can find out if and how FE is taught at the school and who is responsible for teaching it.[5] Our main focus is placed on the information provided by the principals to the question of whether FE is available for 15 year-old students at their school.[6] We can use this information to construct our main variable of interest (*FE availability*).[7] Likewise, school principals also report how financial education is taught, i.e. whether it is taught as a separate subject (*FE course*) or as part of other subjects (*FE cross-curricular*). Thus we have defined two dummy variables according to this information. To build these variables, we took into account information supplied by the principals on the teaching hours spent on each type of course.[8]

We also selected some variables representative of the characteristics of the teaching institution,

[5]The information available in this respect refers exclusively to the whether the training is given by teachers from the school or from external institutions. Unfortunately, no information is available on teaching staff's expertise with respect to financial issues.

[6]The possible responses are: *(a) FE is not available; (b) FE has been available for less than two years; (c) FE has been available for two years or more.*

[7]We collapsed information about responses b and c into a single option (FE availability), thus we can construct a binary variable whose value is one if FE is available and 0 if it is not.

[8]The original information provided by school principals refers to the number of hours per year, divided into five categories (not at all, 1–4, 5–19, 20–49 and more than 50). To build the dichotomous variables, we followed the criterion of assigning a value of zero if the principals marked options a or b (we regard a training of less than five hours per year to be practically non-existent) and a value of one if they marked options c, d or e.

such as school type (public or government-subsidized/private), two indicators representative of school principal leadership skills (LEADCOM and LEADINST),[9] another two that approximate the level of decision-making responsibility on the curriculum and evaluation (RESPCUR) and resource allocation (RESRES)[10] and, finally, an indicator that approximates the peer effect, represented by the mean of the ESCS variable of students from the same school.[11] Table 1 defines all the variables included in our empirical study and Table 2 displays the descriptive statistics for these variables in the Spanish sample.

Besides variable selection, we should note that the dataset needed to be manipulated for the purposes of empirical analysis in order to avoid the usual problems derived from missing values for some variables.[12] We apply a multiple imputation method which consists of filling the missing values using an iterative chained equations process (Schafer 1999; Royston, 2009). Moreover, for our main variables of interest (FE availability, FE course and FE cross-curricular), we applied an additional procedure of imputation using the information supplied by principals in their questionnaire responses. This procedure was applied after detecting several cases in which the principals did not supply information on FE availability at the school but gave positive responses to questions like who taught FE or whether financial education was part of the content of other subjects (cross-curricular education). As a result, we identify that almost half of the sample

Table 2. Descriptive statistics.

	Mean	SD	Min	Max
Difference between competences	0.6621	75.3491	−275.47	256.68
Gender	0.4724	0.4995	0	1
Age	15.8540	0.2833	15.33	16.33
Immigrant	0.0933	0.2910	0	1
No preschooling	0.0609	0.2394	0	1
MaternalEduc	0.3819	0.4861	0	1
PaternalEduc	0.4016	0.4901	0	1
Books <25	0.2229	0.4164	0	1
Books>200	0.2771	0.4478	0	1
Private	0.0962	0.2950	0	1
Mean ESCS	−0.1289	0.6229	−3.33	1.35
LEADCOM	−0.4249	0.8462	−2.87	2.84
LEADINST	−0.6266	1.0813	−3.85	2.14
RESPCUR	−0.4453	0.7036	−1.23	1.44
RESPRES	−0.3718	0.6867	−0.79	2.71
FE availability	0.4971	0.5002	0	1
FE course	0.0695	0.2551	0	1
FE cross-curricular	0.4362	0.4961	0	1

Table 1. Variable description.

	DESCRIPTION
Dependent variable	
Difference between two competences	Differences between reading comprehension and financial knowledge for each plausible value
Control variables (at individual and school level)	
Gender	Dichotomous variable whose value is 1 if the student is a girl
Age	Continuous variable reflecting the age of the student considering years, months and days from the date of birth to the date of the test
Immigrant	Dichotomous variable whose value is 1 if the student is a first-generation immigrant
No preschooling	Dichotomous variable whose value is 1 if the student did not attend preschool
MaternalEduc	Dichotomous variable whose value is 1 if the student's mother has higher education
PaternalEduc	Dichotomous variable whose value is 1 if the student's father has higher education
Books < 25	Dichotomous variable whose value is 1 if there are fewer than 25 books in the household
Books> 200	Dichotomous variable whose value is 1 if there are more than 200 books in the household
Private	Dichotomous variable whose value is 1 if the school is a private or government-subsidized independent school
Mean ESCS	Mean ESCS variable of all the students from the same school
LEADCOM	Compound index representing the principal's ability to communicate the school's goals and curriculum development
LEADINST	Compound index representing the principal's leadership with regard to educational issues
RESPCUR	Compound index representing the school managers' responsibility for resource allocation
RESPRES	Compound index representing the school managers' decision-making responsibility on school curriculum and evaluation
Variables specifically related to FE	
FE availability	Dichotomous variable whose value is 1 if the student receives some sort of FE at the school
FE course	Dichotomous variable whose value is 1 if FE is taught by means of a specific course (at least five hours)
FE cross-curricular	Dichotomous variable whose value is 1 if FE is taught by means of a cross-curricular course (at least five hours)

[9]Both indicators were built by PISA specialists taking the responses provided by the principals to a number of questions asking about the frequency with which they perform a series of activities as a baseline (see OECD 2014b, pp. 343–346 for a more detailed description).
[10]These indicators were also built by PISA specialists taking the responses of principals to several questions structured similarly to the above as a baseline (see OECD 2014b, p. 310).
[11]The ESCS variable is a synthetic index built by PISA specialists based on information supplied by students on several issues related to their socioeconomic environment like their parents' educational level and job qualifications or possessions related to culture in the household.
[12]These values were as much as 18% in some cases.

provides some kind of financial education training, being the cross-curricular approach the most common option among them. Likewise, if we observe the distribution of observations across regions (Table 3), we detect that the availability of financial education is more intensive in regions that decided to participate in the 'Finance for All' pilot program. In fact, all the observations belonging to schools teaching specific FE courses are concentrated in those five regions (Andalusia, Castile and Leon, Madrid, Murcia and Navarre).

As mentioned previously, our main aim is to analyze whether FE availability at the teaching institution leads to an improvement in students' financial literacy. To do this, it is necessary to take into account the type of students enrolled in schools in order to properly evaluate the effect of this type of training and rule out possible selection bias between schools that do and do not provide this instruction. Therefore, we need to check whether the characteristics of the students attending schools where FE courses are taught are different from schools where no such courses are available, that is, if there is a self-selection bias into the treatment. For that purpose, we calculate the mean differences between the two subsamples for a set of representative variables at both individual level (including gender, age, immigrant status, preschool attendance, parents' educational level and number of books in the household) and school level (attendance of a private/government-subsidized school and the mean socioeconomic level of students of the school as a proxy of the peer-effect).

As the values reported in Table 4 show, the students in the two subsamples are quite similarly distributed, and no significant differences can be found for any of the considered variables. As a

Table 3. Distribution of observations across regions.

		FE availability				FE cross-curricular		FE course	
	TOTAL	NO		YES		YES		YES	
Region	Obs.	Obs.	%	Obs.	%	Obs.	%	Obs.	%
Andalusia	182	60	32.97%	122	67.03%	102	56.04%	20	10.99%
Aragon	32	25	78.13%	7	21.88%	7	21.88%	0	0.00%
Asturias	29	29	100.00%	0	0.00%	0	0.00%	0	0.00%
Blearic Islands	18	18	100.00%	0	0.00%	0	0.00%	0	0.00%
Cantabria	23	12	52.17%	11	47.83%	11	47.83%	0	0.00%
Castile and Leon	46	14	30.43%	32	69.57%	24	52.17%	8	17.39%
Catalonia	140	73	52.14%	67	47.86%	67	47.86%	0	0.00%
Extremadura	27	19	70.37%	8	29.63%	8	29.63%	0	0.00%
Galicia	46	26	56.52%	20	43.48%	20	43.48%	0	0.00%
La Rioja	17	10	58.82%	7	41.18%	7	41.18%	0	0.00%
Madrid	119	41	34.45%	78	65.55%	48	40.34%	30	25.21%
Murcia	31	13	41.94%	18	58.06%	11	35.48%	7	22.58%
Navarre	32	0	0.00%	32	100.00%	24	75.00%	8	25.00%
Basque Country	62	41	66.13%	21	33.87%	21	33.87%	0	0.00%
Rest of Spain	246	147	59.76%	99	40.24%	99	40.24%	0	0.00%
Total	**1,050**	**528**	**50.29%**	**522**	**49.71%**	**458**	**43.62%**	**73**	**6.95%**

Table 4. Differences between the two subsamples according to FE availability.

	With FE		Without FE			
Variable	Mean	Std. Dev.	Mean	Std. Dev.	Mean difference	t-test (mean difference)
PVmat	485.07	3.8308	485.75	3.6676	−0.6821	0.1286
PVlect	483.37	4.2873	481.17	3.9695	2.2019	0.9571
PVfin	489.66	3.7598	485.57	3.6785	3.9857	1.1471
Gender	0.4827	0.5001	0.4621	0.4992	0.0206	0.6692
Age	15.859	0.2926	15.848	0.2740	0.0105	0.6015
Immigrant	0.0977	0.2972	0.0890	0.2850	0.0086	0.4834
No preschooling	0.0689	0.2536	0.0530	0.2243	0.0159	1.0787
MaternalEduc	0.3716	0.4837	0.3920	0.4886	−0.0204	0.6797
PaternalEduc	0.4157	0.4933	0.3844	0.4869	0.0312	1.0327
Books < 25	0.2356	0.4248	0.2102	0.4078	0.0254	0.9881
Books> 200	0.2567	0.4372	0.2973	0.4575	−0.0406	1.4713
Private	0.0900	0.2865	0.1022	0.3032	−0.0122	0.6718
Mean ESCS	−0.1255	0.6274	−0.1322	0.6189	−0.0067	0.1742
Observations	522		528			

result, both subsamples are comparable with each other. There are no significant differences between the results for students in the mathematics or reading comprehension tests either. Finally, we find that students attending schools where FE is available present slightly better results in financial literacy, although the differences are not statistically significant.

V. Results

Table 5 displays the results of estimating Equation 3 using OLS for all the observations available considering three alternative models. Model 1 only analyses the effect of the availability of FE in the school, whereas Models 2 and 3 include two additional dichotomous variables that represent the two alternative ways of implementing FE (through a specific course or adopting a cross-curricular approach) separately. Finally, Model 4 includes both dichotomous variables together since it is possible that some schools could decide to use both alternatives. The sample weights provided by PISA dataset were applied when estimating these models. This guarantees that each student within the sample is properly represented. Additionally, we accounted for the fact that students are grouped by schools, applying the appropriate adjustment to calculate the standard errors using the bootstrap method, and the information provided by the five plausible values that the PISA database includes, where the dependent variable is the difference between the value for financial literacy and reading comprehension. Table 5 shows the mean values of the coefficients and standard deviations for the five estimates conducted as recommended by OECD in their reports (see OECD 2014b).

According to the information shown in Table 5, the transmission of knowledge related to FE at the teaching institution does not have any effect on student knowledge acquisition. The result is consistent with the evidence reported in other empirical

Table 5. Results applying OLS.

Model 1		Model 2		Model 3		Model 4	
FE availability	−5.924	FE availability	0.469	FE availability	−7.193	FE availability	−4.524
	(4.162)		(4.346)		(4.184)		(6.42)
		FE course	−38.82***	FE cross-curricular	45.09***	FE course	−8.317
			(9.335)		(6.519)		(15.40)
						FE cross-curricular	44.28***
							(16.16)
Gender	−22.94***	Gender	−21.69***	Gender	−22.91***	Gender	−21.67***
	(4.140)		(4.093)		(4.004)		(3.997)
Age	12.06*	Age	10.23	Age	11.96*	Age	10.15
	(6.637)		(7.569)		(7.099)		(7.682)
Immigrant	5.212	Immigrant	4.230	Immigrant	4.846	Immigrant	4.161
	(6.852)		(7.301)		(7.283)		(7.534)
No Preschooling	−29.49***	No Preschooling	−37.20***	No Preschooling	−28.62***	No Preschooling	−36.72***
	(8.379)		(7.766)		(7.010)		(8.559)
MaternalEduc	−14.79***	MaternalEduc	−15.78***	MaternalEduc	−15.14***	MaternalEduc	−15.86***
	(4.201)		(6.019)		(4.309)		(5.126)
PaternalEduc	8.107*	PaternalEduc	10.65*	PaternalEduc	8.210**	PaternalEduc	10.86**
	(4.812)		(5.976)		(3.848)		(5.154)
Books < 25	−6.325	Books < 25	−3.853	Books < 25	−6.247	Books < 25	−3.898
	(4.188)		(5.659)		(5.673)		(5.018)
Books > 200	−3.924	Books > 200	−2.311	Books > 200	−3.985	Books > 200	−2.546
	(3.924)		(5.619)		(4.755)		(5.203)
Priv/GSI	7.630	Priv/GSI	10.93	Priv/GSI	7.006	Priv/GSI	10.05
	(7.304)		(8.552)		(6.231)		(7.959)
MeanESCS	6.837**	MeanESCS	7.673*	MeanESCS	8.149**	MeanESCS	8.597**
	(3.025)		(4.465)		(3.292)		(3.597)
LEADINST	−4.460**	LEADINST	−4.892**	LEADINST	−4.857***	LEADINST	−4.371*
	(1.769)		(2.317)		(1.857)		(2.370)
LEADCOM	5.415**	LEADCOM	4.391	LEADCOM	5.875**	LEADCOM	3.296
	(2.658)		(2.873)		(2.709)		(3.100)
RESPRES	−5.140	RESPRES	−2.023	RESPRES	−3.989	RESPRES	−3.107
	(3.427)		(3.685)		(3.452)		(3.390)
RESPCUR	8.206***	RESPCUR	7.079**	RESPCUR	6.896**	RESPCUR	6.558**
	(2.869)		(2.755)		(3.268)		(3.143)
Constant	−168.5	Constant	−141.7	Constant	−166.8	Constant	−141.3
	(104.6)		(118.5)		(113.3)		(121.9)

The standard errors are shown between parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1

studies referring to the United States (Mandell 2008; Willis 2008; Cole, Paulson, and Shastry 2016). Likewise, if we focus on the results of the three multiple treatment models, we also observe that the availability of FE is ineffective irrespective of the type of training adopted. The most striking result is that cross-curricular training significantly contributes to the improvement of financial literacy, while the availability of a specific FE training course has a negative effect, although it vanishes when it is included in the regression together with variable representing cross-curricular training. This result has major implications with respect to how training on such competences should be instrumented.

To supplement this analysis, we also present the results of estimating the model using the quantile regression method. In particular, we estimated the model for three quartiles (0.25, 0.50 and 0.75), although, for reasons of space, Table 6 only shows the results of the median regression method (0.50) for Models 1, 2, 3 and 4.[13] The values of the estimated parameters for the main variables of interest confirm that FE availability at the teaching institution is not statistically significant. Likewise, we also detect a positive effect for cross-curricular training and a negative effect for specific training that disappears if this variable is included together with the other alternative of implementation.

Apart from analyzing the effectiveness of FE, it is worthwhile interpreting the information provided by the parameters associated with the control variables included in the models. Thus, for example, we find that there are significant differences by gender (in favor of boys), by age (with OLS only and weak significance) and between students that have and have not attended preschool, but not between native and immigrant students. With regard to the indicators representing family background, we

Table 6. Results of the estimations using mean quantile regression.

Model 1		Model 2		Model 3		Model 4	
FE availability	−5.034	FE availability	1.742	FE availability	−4.817	FE availability	−5.137
	(5.085)		(5.573)		(5.214)		(25.58)
		FE course	−44.70***	FE cross-curricular	40.66***	FE course	2.888
			(10.54)		(10.29)		(20.36)
						FE cross-curricular	56.53**
							(24.10)
Gender	−22.44***	Gender	−27.84***	Gender	−22.92***	Gender	−24.25***
	(6.268)		(7.263)		(5.722)		(8.219)
Age	6.644	Age	−1.729	Age	9.555	Age	10.63
	(11.23)		(11.22)		(10.27)		(15.32)
Immigrant	−9.556	Immigrant	−10.30	Immigrant	−9.925	Immigrant	−19.62
	(9.242)		(8.706)		(8.635)		(13.81)
No Preschooling	−20.47*	No Preschooling	−30.57***	No Preschooling	−22.43*	No Preschooling	−20.41
	(11.62)		(10.79)		(11.56)		(21.20)
MaternalEduc	−12.23*	MaternalEduc	−15.62**	MaternalEduc	−13.05**	MaternalEduc	−15.72*
	(6.580)		(6.792)		(6.054)		(8.604)
PaternalEduc	3.057	PaternalEduc	6.583	PaternalEduc	2.639	PaternalEduc	12.74
	(6.322)		(8.148)		(6.303)		(8.696)
Books <25	−2.321	Books <25	−1.617	Books <25	−1.493	Books <25	5.707
	(7.507)		(7.699)		(6.627)		(10.78)
Books > 200	−6.928	Books > 200	−6.570	Books > 200	−6.378	Books > 200	−12.79
	(6.007)		(7.746)		(6.799)		(9.689)
Priv/GSI	12.38	Priv/GSI	7.085	Priv/GSI	11.62	Priv/GSI	17.28*
	(11.20)		(11.52)		(8.665)		(10.11)
MeanESCS	2.697	MeanESCS	5.616	MeanESCS	4.263	MeanESCS	−0.868
	(4.356)		(4.387)		(4.498)		(7.807)
LEADINST	−3.438	LEADINST	−5.828*	LEADINST	−4.363	LEADINST	−0.678
	(3.061)		(3.014)		(3.326)		(3.166)
LEADCOM	3.426	LEADCOM	6.717	LEADCOM	4.902	LEADCOM	−1.745
	(3.289)		(4.515)		(4.083)		(4.794)
RESPRES	0.639	RESPRES	4.288	RESPRES	2.605	RESPRES	−0.0839
	(5.360)		(5.330)		(6.043)		(5.169)
RESPCUR	4.403	RESPCUR	2.222	RESPCUR	2.375	RESPCUR	8.326
	(4.178)		(5.301)		(4.884)		(5.714)
Constant	−86.43	Constant	49.70	Constant	−132.2	Constant	−102.7
	(178.3)		(179.9)		(163.4)		(242.1)

The standard errors are shown between parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1

[13]The significance of the parameters does not vary with respect to the main variables of interest. The results for the other quantile estimations are available upon request.

find that the parameter that has a larger significant effect is mother's educational level, although this effect is negative, which implies that this is a factor that accounts largely for the reading comprehension results. Another interesting result is the non-significance of variables representing the number of books in the household, especially because this is usually one of the most important factors for explaining educational achievement in other subjects like mathematics or reading comprehension (Evans et al. 2010).

With regard to school variables, we find some deviations between the results of the two estimations. Thus, we found that the composition of the school students, approximated by means of the mean socioeconomic level of peers, is statistically significantly related to the dependent variable in the estimation by OLS. Likewise, we do not find significant differences between public and private/government-subsidized schools. However, both aspects are not significant in the quantile estimation. Finally, the two variables used to account for principals' leadership skills have opposite effects in OLS estimations, which suggests that one has more influence on the reading comprehension education (LEADINST) and the other on financial literacy (LEADCOM). Likewise, we find that there is a positive and statistically significant relationship with the variable representing the responsibility of local managers for curriculum management and evaluation (RESPCUR) according to the OLS estimation.

VI. Concluding remarks

In this paper, we reported the evaluation of the effect of adopting financial education into the school curriculum using the information provided by the PISA 2012 database, which for the first time evaluated the Spanish students' knowledge of competences related to money management and different financial products. According to the results of the proposed empirical analysis, the availability of financial education in the school does not have any effects *per se*, although their implementation using a cross-curricular approach, that is, as part of the curriculum of other subjects, can make a significant contribution to the acquisition of financial literacy.

This result is very interesting bearing in mind that, since the LOMCE was passed in 2013, FE has been adopted on a cross-curricular basis as part of the primary and secondary school curriculum. In any case, we should not overlook the fact that the implementation of FE can have a series of direct and opportunity costs, which should be examined from the cost-benefit analysis viewpoint. In this respect, note that there are less costly options, such as the reinforcement of mathematics education, which could lead to more significant improvements in financial literacy (see Cole, Paulson, and Shastry 2016). Even so, more specific complementary training on financial matters would still be necessary to acquaint students with the broad spectrum of activities that are part of financial literacy.

Note that our analysis has some limitations that could partly explain the results. The main shortcoming is that we do not have individualized information about the specific training that each student has received or their level of achievement. This poses a serious threat to the validity of the results. On top of this, the empirical analysis did not take into account the quality of the teachers that teach FE, even though this is a factor that, according to several researchers, may have an influence on the success of this type of initiatives (Way and Holden 2009; Walstad et al., 2010). In this respect, Mandell (2008) points out that better materials and, especially, better teacher training are required for FE programs to be effective. Unfortunately, the PISA 2012 database does not provide information on this major issue.

Neither did the analysis take into account that the students have rather heterogeneous experience in money-related issues. Although the PISA database does provide this information, it is only available for half of the evaluated students, as a result of which it cannot be adopted as control variables in our model because we would run into serious trouble regarding missing values. With regard to this issue, some authors have suggested that FE programs targeting individuals with particular characteristics are usually more effective than general-purpose courses (Lusardi, Michaud, and Mitchell 2013). This could explain why FE programs proved to be ineffective in Spain.

Finally, note that the number of schools providing this type of education should grow over the coming

years with the gradual adoption of financial education in the school curriculum in both primary and secondary education, scheduled after the adoption of the LOMCE. Therefore, it will be interesting to reanalyze the effectiveness of these initiatives in the near future to check whether these measures have helped to improve Spanish students' financial literature. Unfortunately, the 2015 PISA wave provided hardly any information with regard to the deployment of financial education in schools, and it is therefore not possible to conduct a comparable study using those data. We trust that future waves will again gather the data necessary to be able to reexamine the effectiveness of these initiatives in a context where many more teaching institutions offer financial education.

Acknowledgments

The authors would like to express their gratitude to the Savings Banks Foundation (Fundación de las Cajas de Ahorros –FUNCAS-) and the Spanish Ministry for Economy and Competitiveness for supporting this research through grant ECO2017-83759-P.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This work was supported by the Ministerio de Economia, Industria y Competitividad [ECO2017-83759-P] and the Saving Banks Foundation (Fundación de las Cajas de Ahorros –FUNCAS-).

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References

Appleyard, L., and K. Rowlingson. 2013. "Children and Financial Education: Challenges for Developing Financial Capability in the Classroom." *Social Policy and Society* 12 (04): 507–520.

Atkinson, A., and F. A. Messy 2013. Promoting Financial Inclusion through Financial Education. *OECD Working Papers on Finance, Insurance and Private Pensions*, (34), 1.

Batty, M., J. M. Collins, and E. Odders-White. 2015. "Experimental Evidence on the Effects of Financial Education on Elementary School Students' Knowledge, Behavior, and Attitudes." *Journal of Consumer Affairs* 49 (1): 69–96.

Becchetti, L., S. Caiazza, and D. Coviello. 2013. "Financial Education and Investment Attitudes in High Schools: Evidence from a Randomized Experiment." *Applied Financial Economics* 23 (10): 817–836.

Bernheim, B. D., D. M. Garrett, and D. M. Maki. 2001. "Education and Saving: The Long-Term Effects of High School Financial Curriculum Mandates." *Journal of Public Economics* 80 (3): 435–465.

Berry, J., D. Karlan, and M. Pradhan 2015. The Impact of Financial Education for Youth in Ghana. *National Bureau of Economic Research*, Paper No. 21068.

Bietenbeck, J. 2014. "Teaching Practices and Cognitive Skills." *Labour Economics* 30: 143–153.

Bruhn, M., L. de Souza Leão, A. Legovini, R. Marchetti, and B. Zia 2013. Financial Education and Behavior Formation: Large-Scale Experimental Evidence from Brazil. *Presentation, World Bank, Washington*, DC.

Bucher-Koenen, T., and A. Lusardi. 2011. "Financial Literacy and Retirement Planning in Germany." *Journal of Pension Economics and Finance* 10 (04): 565–584.

Christelis, D., T. Jappelli, and M. Padula. 2010. "Cognitive Abilities and Portfolio Choice." *European Economic Review* 54 (1): 18–38.

Cole, S., A. Paulson, and G. K. Shastry. 2016. "High School Curriculum and Financial Outcomes: The Impact of Mandated Personal Finance and Mathematics Courses." *Journal of Human Resources* 51 (3): 656–698.

Cole, S., T. Sampson, and B. Zia. 2011. "Prices or Knowledge? What Drives Demand for Financial Services in Emerging Markets?" *The Journal of Finance* 66 (6): 1933–1967.

Collins, J. M., and C. M. O'Rourke. 2010. "Financial Education and Counseling - Still Holding Promise." *Journal of Consumer Affairs* 44 (3): 483–498.

Cordero, J. M., V. Cristobal, and D. Santín. 2017. "Causal Inference on Education Policies: A Survey of Empirical Studies Using PISA, TIMSS and PIRLS." *Journal of Economic Surveys* en prensa. doi:10.1111/joes.12217.

Dee, T. S. 2005. "Teachers and the Gender Gaps in Student Achievement." *Journal of Human Resources* 42 (3): 528–554.

Disney, R., and J. Gathergood. 2013. "Financial Literacy and Consumer Credit Portfolios." *Journal of Banking and Finance* 37 (7): 2246–2254.

Duflo, E., R. Glennerster, and M. Kremer. 2007. "Using Randomization in Development Economics Research: A Toolkit." *Handbook of Development Economics* 4: 3895–3962.

Evans, M., J. Kelley, J. Sikora, and D. Treiman. 2010. "Family Scholarly Culture and Educational Success Books and Schooling in 27 Nations." *Research in Social Stratification and Mobility* 28 (2): 171–197.

Fernandes, D., J. G. Lynch Jr, and R. G. Netemeyer. 2014. "Financial Literacy, Financial Education, and Downstream Financial Behaviors." *Management Science* 60 (8): 1861–1883.

Fornero, E., and C. Monticone. 2011. "Financial Literacy and Pension Plan Participation in Italy." *Journal of Pension Economics and Finance* 10 (04): 547–564.

Fox, J., S. Bartholomae, and J. Lee. 2005. "Building the Case for Financial Education." *Journal of Consumer Affairs* 39 (1): 195–214.

Gerardi, K., L. Goette, and S. Meier 2010. Financial Literacy and Subprime Mortgage Delinquency: Evidence from a Survey Matched to Administrative Data. *Federal Reserve Bank of Atlanta, Working Paper Series* No. 2010–10.

Gnan, E., M. A. Silgoner, and B. Weber. 2007. "Economic and Financial Education: Concepts, Goals and Measurement." *Monetary Policy & the Economy Quarterly* 3 (1): 28–49.

Grifoni, A., and F. Messy 2012. *Current Status of National Strategies for Financial Education: A Comparative Analysis and Relevant Practices*, OECD Working Papers on Finance, Insurance and Private Pensions, No. 16, OECD Publishing.

Guiso, L., and T. Jappelli. 2002. "Household Portfolios in Italy." In *Household Portfolios*, 251–289, MIT press.

Hastings, J. S., B. C. Madrian, and W. L. Skimmyhorn. 2013. "Financial Literacy, Financial Education, and Economic Outcomes." *Annual Review of Economics* 5 (1): 347–373.

Hill, R. C., W. E. Griffiths, and G. C. Lim. 2008. *Principles of Econometrics*. 4th ed. Hoboken, NJ: Wiley.

Hospido, L., E. Villanueva, and G. Zamarro 2015. Finance for All: The Impact of Financial Literacy Training in Compulsory Secondary Education in Spain, Banco de España, Working Paper 1502/2015.

Hung, A., A. M. Parker, and J. Yoong 2009. Defining and Measuring Financial Literacy. *RAND Working Paper 708*.

Jamison, J. C., D. Karlan, and J. Zinman 2014. Financial Education and Access to Savings Accounts: Complements or Substitutes? Evidence from Ugandan Youth Clubs. *National Bureau of Economic Research*, Paper No. 20135.

Jürges, H., K. Schneider, and F. Büchel. 2005. "The Effect of Central Exit Examinations on Student Achievement: Quasi-Experimental Evidence from TIMSS Germany." *Journal of the European Economic Association* 3 (5): 1134–1155.

Koenker, R., and G. Basset. 1978. "Regression Quantiles." *Econometrica* 46 (1): 33–50.

Koenker, R., and K. F. Hallock. 2001. "Quantile Regression." *Journal of Economic Perspectives* 15 (4): 143–156.

Lührmann, M., M. Serra-Garcia, and J. Winter. 2015. "Teaching Teenagers in Finance: Does It Work?" *Journal of Banking & Finance* 54: 160–174.

Lusardi, A., and O. S. Mitchell. 2007. "Financial Literacy and Retirement Planning in the United States." *Journal of Pension Economics and Finance* 10 (04): 509–525.

Lusardi, A., and O. S. Mitchell. 2014. "The Economic Importance of Financial Literacy: Theory and Evidence." *Journal of Economic Literature* 52 (1): 5–44.

Lusardi, A., and P. Tufano. 2015. "Debt Literacy, Financial Experiences, and Overindebtedness." *Journal of Pension Economics and Finance* 14 (04): 332–368.

Lusardi, A., P. C. Michaud, and O. S. Mitchell 2013. Optimal Financial Knowledge and Wealth Inequality. *National Bureau of Economic Research*, Paper No. 18669.

Lyons, A., L. Palmer, K. Jayaratne, and E. Scherpf. 2006. "Are We Making the Grade? A National Overview of Financial Education and Program Evaluation." *Journal of Consumer Affairs* 40 (2): 208–235.

Mandell, L. 2008. "Financial Education in High School." In *Overcoming the Saving Slump: How to Increase the Effectiveness of Financial Education and Saving Programs*, edited by A. Lusardi, 257–279. Chicago and London: University of Chicago Press.

Mandell, L., and L. S. Klein. 2009. "The Impact of Financial Literacy Education on Subsequent Financial Behavior." *Journal of Financial Counseling and Planning* 20 (1): 15-24.

McCormick, M. H. 2009. "The Effectiveness of Youth Financial Education: A Review of the Literature." *Journal of Financial Counseling and Planning* 20 (1): 70–83.

Messy, F., and C. Monticone 2012. *The Status of Financial Education in Africa*, OECD *Working Papers on Finance, Insurance and Private Pensions*, No. 25, OECD Publishing, Paris.

Messy, F., and C. Monticone 2016. *Financial Education Policies in Asia and the Pacific*, OECD *Working Papers on Finance, Insurance and Private Pensions*, No. 40, OECD Publishing, Paris.

Miller, M., J. Reichelstein, C. Salas, and B. Zia. 2015. "Can You Help Someone Become Financially Capable? a Meta-analysis Of The Literature." *The World Bank Research Observer* 30 (2): 220-246.

OECD. 2014a. "PISA 2012 Results: Students and Money: Financial Literacy Skills for the 21st Century (Volume VI) pp. 1-204." In *Pisa*. Paris: OECD Publishing.

OECD. 2014b. *PISA 2012 Technical Report*, OECD Publishing, Paris.

OECD. 2005. *Improving Financial Literacy: Analysis of Issues and Policies*. Paris: OECD Publishing.

OECD. 2013. *Advancing National Strategies for Financial Education*. Paris: OECD Publishing.

Peng, T., S. Bartholomae, J. Fox, and G. Cravener. 2007. "The Impact of Personal Finance Education Delivered in High School and College Courses." *Journal of Family and Economic Issues* 28 (2): 265–284.

Rivkin, S. G., and J. C. Schiman. 2015. "Instruction Time, Classroom Quality, and Academic Achievement." *The Economic Journal* 125: 425–448.

Romagnoli, A., and M. Trifilidis 2013. Does Financial Education at School Work? Evidence from Italy. Evidence from Italy. *Bank of Italy Occasional Paper*, (155).

Royston, P. 2009. "Multiple Imputation Of Missing Values: Further Update Of Ice, with an Emphasis on Categorical Variables." *Stata Journal* 9 (3): 466–477.

Schafer, J. L. 1999. "Multiple Imputation: A Primer." *Statistical Methods in Medical Research* 8 (1): 3–15.

Schlotter, M., G. Schwerdt, and L. Woessmann. 2011. "Econometric Methods for Causal Evaluation of Education Policies and Practices: A Non-Technical Guide." *Education Economics* 19 (2): 109–137.

Schwerdt, G., and A. C. Wuppermann. 2011. "Is Traditional Teaching Really All that Bad? A Within-Student Between-Subject Approach." *Economics of Education Review* 30 (2): 365–379.

Shim, S., B. L. Barber, N. A. Card, J. J. Xiao, and J. Serido. 2010. "Financial Socialization of First-Year College Students: The Roles of Parents, Work, and Education." *Journal of Youth and Adolescence* 39 (12): 1457–1470.

Stango, V., and J. Zinman. 2009. "Exponential Growth Bias and Household Finance." *The Journal of Finance* 64 (6): 2807–2849.

Swinton, J. R., T. W. DeBerry, B. Scafidi, and H. C. Woodard. 2007. "The Impact of Financial Education Workshops for Teachers on Students' Economic Achievement." *The Journal of Consumer Education* 24: 63–77.

Tennyson, S., and C. Nguyen. 2001. "State Curriculum Mandates and Student Knowledge of Personal Finance." *Journal of Consumer Affairs* 35 (Winter): 241–262.

Van Rooij, M., A. Lusardi, and R. Alessie. 2011. "Financial Literacy and Stock Market Participation." *Journal of Financial Economics* 101 (2): 449–472.

Van Rooij, M. C. J., A. Lusardi, and R. J. M. Alessie. 2012. "Financial Literacy, Retirement Planning and Household Wealth." *The Economic Journal* 122 (560): 449–478.

Walstad, W. B. 2013. "Economic Understanding in US High School Courses." *The American Economic Review* 103 (3): 659–663.

Walstad, W.B., K. Rebeck, and R.A. MacDonald. 2010. "The Effects Of Financial Education on The Financial Knowledge Of High School Students." *Journal of Consumer Affairs* 44 (2): 336-357.

Way, W. L., and K. C. Holden. 2009. "2009 Outstanding AFCPE Conference Paper Teachers' Background and Capacity to Teach Personal Finance: Results of a National Study." *Journal of Financial Counseling and Planning* 20 (2): 64.

Willis, L. E. 2008. "Against Financial Literacy Education." *Iowa Law Review* 94: 08–10.

Willis, L. E. 2011. "The Financial Education Fallacy." *American Economic Review* 101 (3): 429–434.

Wu, M. 2005. "The Role of Plausible Values in Large Scale Surveys." *Studies in Educational Evaluation* 31: 114–128.

Xu, L., and B. Zia 2012. Financial Literacy around the World: An Overview of the Evidence with Practical Suggestions for the Way Forward. *World Bank Policy Research Working Paper*, 6107.