

The drivers of adult financial literacy: Exploring the role of attitudes towards finance

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Abstract

This study investigates the factors driving the financial literacy of adult population in Spain using a regression count model (specifically the latent class Poisson model). The paper pays special attention to the effect of certain financial attitudes and financial personality traits (such as financial myopia, risk aversion, attitude to financial planning and self-perception of financial vulnerability) upon financial literacy. The results demonstrate a positive association between the financial skills, the sociodemographic characteristics and the attitudes and personality traits of individuals regarding finances. Furthermore, the analysis permits the conclusion that the effects of the financial attitudes analysed in the study vary among the different population groups, which suggests the need to adapt financial literacy promotional programs to the characteristics of the target group. Findings have implications for financial educators, practitioners and policymakers to help them recognize the proper financial program to be delivered on the basis of the FL levels and the sociodemographic composition of the individuals.

KEYWORDS

financial attitudes, financial literacy, latent class Poisson model, Spain, survey of financial competences

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1 | INTRODUCTION

Various studies undertaken over the last twenty years have revealed the limited knowledge of the population on issues related to economics and finances. This situation affects the citizens of developed countries, such as the United States, Japan, the members of the European Union or Australia, as well as those of developing nations, such as Thailand, Malaysia, or Taiwan. This has been evidenced in multiple surveys performed in these countries, where questions specifically designed to measure the understanding of basic financial concepts, such as the compound interest rate, inflation, or risk diversification, have been included. This is truly worrying and has been highlighted in a current socioeconomic context of important demographic, technological and economic changes that require greater involvement of individuals in the management of their finances (Lusardi, 2015). In this context, the need for a financial culture that allows the consumer to properly assess the risks associated with different investment and credit vehicles and make intelligent contracting decisions is indisputable.¹

On the basis of this consideration, the objective of this study is to identify the drivers of financial literacy (hereinafter FL) of the Spanish adult population. In particular, we explore the role of financial attitudes as determinants of FL. Our analysis is based on the premise that FL is not only determined by knowledge and demographic and socio-economic factors, as several studies have pointed out, but also by attributes such as attitudes towards money and the future. The hypothesis underlying this approach is that money is a highly subjective concept, meaning something different to each person (Wernimont & Fitzpatrick, 1972).

As explained in more detail in Section 2, the study of the drivers of FL has been the subject of analysis in a number of international studies. Most of such studies analyse the determinants of FL in the young population, while studies focused on the adult population are much more limited. Besides, in the majority of studies on FL determinants, undertaken in very different economic contexts, attention is concentrated on analysis of the correlation between socio-demographic variables and FL, demonstrating that the demographic factors of gender, age, education, the socio-economic factors of income and occupation and other variables, such as mathematical and reading skills, affect the level of F. This literature has more recently been broadened by several studies devoted to exploring the role of psychological factors in determining financial literacy, showing that confidence, trust, risk preferences, financial satisfaction, future orientation, anxiety, perceptions of the future and other factors shape the acquisition of financial knowledge. However, all the previous studies use an econometric framework that do not into account that the dependent variable is a discrete count variable, i.e., a variable that consists of non-negative integers, as it is generally built as the number of correct answers to several questions devoted to measure the level of financial literacy. But the use of linear regression models for count outcomes may result in inefficient, inconsistent, and biased estimates (Long & Freese, 2006). Our study aims to contribute to the previous literature on financial literacy' determinants employing a count regression model, the latent class Poisson model, that fits count data very well. In addition, this model is very useful for analysing whether the effects of the variables differ among population groups.

A second contribution of our study is that it focuses its attention on the role that some financial attitudes play in shaping financial skills, an aspect that has been scarcely explored in the literature on the determinants of FL.

Finally, our work focuses on a single country, Spain, where studies of the drivers and consequences of financial literacy are still very scarce. Our study, therefore, will contribute to filling the existing gap in the FL literature regarding Spain.

The study uses the first wave of the Survey of Financial Competences (ECF)—undertaken by the Bank of Spain (BE) and the Spanish National Securities Market Commission (CNMV) in 2016 under the auspices of the OECD and, although published in the month of June 2019, it has been little exploited to date.²

Our results permit the conclusion that the financial competences of Spaniards are dependent not only on sociodemographic factors but also on certain financial attitudes, such as financial planning, risk aversion, financial myopia and self-perception of financial vulnerability. Moreover, the estimation of the Poisson model with latent

classes leads us to conclude that the relationship between financial attitudes and FL varies for different population groups. This result is very important for the design of possible intervention policies aimed at improving the FL of the population, since it highlights that when financial training programs are implemented, they should take into consideration the sociodemographic composition of the target individuals.

The paper is organized as follows. The literature review is summarized in Section 2. Section 3 describes the database and the variables constructed from the ECF and presents a diagnosis of FL and its distribution across adult Spanish citizens. Methodological issues are presented in Section 4. Section 5 offers the empirical results. The paper ends with our most significant conclusions and an Appendix containing annexes.

2 | LITERATURE REVIEW

The studies involved in the identification of FL drivers focus on the process by which consumers develop their financial skills. Their objective is to identify the factors influencing/affecting the promotion of such skills, with the aim of inspiring the policies of intervention which permit their improvement.

From the empirical standpoint, the majority of the studies performed into FL determinants have centred their attention on the collective of youths, principally at the point in which they finish compulsory secondary education. This is to be expected, given that this is when they may enter the labour market and must face up to important financial decisions for the first time. Elsewhere, some research has clearly shown that the training and experience during adolescence largely determine subsequent financial behaviour throughout the life span (Friedline et al., 2011; Garon, 2012). Furthermore, it must not be forgotten that youths and adolescents are the principal users of certain financial products (credit cards, bank accounts) and are active users of online payment services.³ On another point, the publication of the evaluations of the PISA project of the OECD, which since the 2012 edition have incorporated financial competences, has contributed to the emergence of quantitative studies of the financial literacy of this collective. From among the studies which employ PISA data to analyse the drivers of FL are prominent those by Lusardi and López (2016) for USA, Riitsalu and Pöder (2016) for Estonia, Arellano et al. (2014), Mancebón and Ximénez-de-Embún (2014) and Mancebón et al. (2019) for Spain, and Molina et al. (2015), Moreno-Herrero et al. (2018a, 2018b) and Cordero Ferrera et al. (2022) for the set of countries participating in PISA 2012 and 2015. The greater part of these studies demonstrates a low level of financial competences in the youths from all the countries studied. Furthermore, the majority of the above studies display common patterns with regard to the factors which intervene in the makeup of such competences. Thus, gender is shown to be one of the variables determining the level of financial literacy of 15-year-old youths, it is females who systematically display inferior levels.

Other important variables are immigration status (a negative influence on FL), the socioeconomic status of the parental home, maths and linguistic skills (the most important factor in several studies) and conversations with parents regarding financial subjects. In the studies by Moreno-Herrero et al. (2018a, 2018b), it can be observed that the possession of a bank account and/or credit card by the student has a positive influence upon FL in a number of the countries analysed.

The study by Arellano et al. (2014) found that Spanish students with higher levels of confidence—whether it be self-confidence in the environment of their school, self-confidence with regard to the usefulness of their school, self-confidence concerning the results obtained, or self-confidence in a broader sense—produce higher scores in financial literacy tests.

Equally focused on adolescents, but making use of their own surveys, designed ad hoc, are the studies by Sohn et al. (2012), Cameron et al. (2014); Erner et al. (2016), Hayei and Khalid (2019), Amagir et al. (2020), Douissa (2020) and Böhm et al. (2023). The first examined the relationship between FL and socialization agents (e.g. school, family, peers and the media), financial experiences and attitudes to money for the collective of

South Korean adolescents. Their principal conclusions are that those who chose the media as their primary financial socialization agent, who had a bank account, who saw money as a reward for efforts exhibited and those with mid-range monthly allowances tended to report higher levels of financial literacy. The study by Cameron et al. (2014) investigates the drivers of FL for New Zealand high school students, showing that poorer students, those with a lower level of English, and those with lesser mathematics skills exhibited the lowest level of FL.

In turn, in the study by Erner et al. (2016), the type of learning centre attended by German students is the principal factor explaining their financial skills; it is the youngsters attending the schools which are most demanding in academic terms (the *Gymnasium*) who obtain the best results in questions regarding financial competences. In the study by Hayei and Khalid (2019), undertaken on students between 15 and 17 who attend private schools in Kuala Lumpur, the variables which appear as the most important determinants of financial skills are age (a positive effect) and parental influence; concretely, if the latter have explained to their offspring the importance of saving. The attitudes to finances shown by students also present a significant and positive statistical effect in this study (their attitudes to saving, loans, investment and purchasing patterns).

Amagir et al. (2020) examine four dimensions of financial literacy (knowledge, attitudes, self-efficacy, and self-reported behaviour) among 15-year-old high school students in the Netherlands and investigate which factors are associated with the various components of financial literacy. They find that students with low mathematical ability, immigrant students, students with low SES, students with mothers without a university degree, and students who do not discuss financial matters with family and peers have lower financial literacy.

The study by Douissa (2020) analyses the main socioeconomic and demographic factors of financial literacy among university students in the United Arab Emirates. Its main conclusion is that factors extensively used in the literature, such as gender, education level, business studies, financial inclusion, or family income only capture the knowledge dimension of financial literacy but they explain neither financial behaviour nor financial attitudes.

Finally, Böhm et al. (2023) aim to identify the factors having the greatest impact on the level of financial literacy of first-year undergraduate students at the University of Žilina, Slovakia. Their results suggest that the student's gender, the father's education, the family's financial background, and the student's part-time work experience are among the most important determinants of financial literacy.

With regard to research focusing on the collective of adults, so far less numerous, we can cite the studies by Shim et al. (2010) and Hanson and Olson (2018) for the United States; Grohmann et al. (2015) for Thailand, Baglioni et al. (2018) for Italy, Skagerlund et al. (2018) for Sweden, Fonseca and Lord (2020) for Canada and Oliver-Márquez et al. (2023) for the Spaniard's regions. Despite differences in the samples and estimation methods, some common patterns were found in the results obtained in these studies. Thus, higher educational level and being self-employed have been found to be positively associated with higher financial knowledge, while being female or to belong to the lowest income group have a greater probability to be financially illiterate.

In some studies, family conversations regarding financial subjects (called by some authors family financial socialization) display a positive and statistically significant effect on financial literacy (Grohmann et al., 2015; Hanson & Olson, 2018; Shim et al., 2010). Furthermore, mathematics skills, in addition to other measures of cognitive and emotional development, are revealed to be determining factors of financial competences in the studies by Grohmann et al. (2015) and Skagerlund et al. (2018).

A minority of the studies cited have also investigated the role of certain factors of financial psychology in determining financial literacy, showing that confidence, trust, risk preferences, financial satisfaction, future orientation, anxiety and perceptions of the future shape the acquisition of financial knowledge. This is the case of the studies by Murphy (2013) for the United States; Arellano et al. (2014) for Spain, Bucher-Koenen and Lamla-Dietrich (2018) for Germany; Fonseca and Lord (2020) para Canada, Kadoya and Khan (2020) for Japan; and Muñoz-Murillo et al. (2020) for Colombia.

3 | MATERIALS AND METHODS

3.1 | Database: The survey of financial competencies

As stated earlier, we explore the drivers of FL using microdata taken from the Survey of Financial Competencies (Encuesta de Competencias Financieras, ECF), undertaken by the Spanish National Central Bank and the National Stock Market Commission in 2016. This survey is part of the Financial Education Plan initiated by the two institutions in 2008, and still active today. The ECF is framed within the international project led by the INFE network of the OECD which has been evaluating the knowledge, attitudes, and basic financial behaviour of the adult population in a wide range of countries (but not including Spain) since 2016 (OECD, 2017).

The main aim of the survey is to gather structural information on FL, assets (real and financial), liabilities (mortgage and non-mortgage debt), and consumption of Spanish households. The data also contain detailed information on respondents, such as their employment status, income, and retirement savings, as well as a number of demographic characteristics including age, gender, marital status, and education. The ECF microdata are representative at both national and regional levels. In summary, the design of the ECF permits the collection of rich information, ideal for our needs in this study.

The ECF sample is comprised of the Spanish population aged between 18 and 79. Preselection was made of a study population of 21,221 individuals. Subsequently, between September 2016 and May 2017, face-to-face interviews were performed, and 8952 completed interviews were compiled. The following phase consisted of the qualitative validation of these tests, giving a final sample of 8554 individuals passing these controls. Finally, these results were completed with weights adjusted for non-response and calibrated on the basis of age, gender, and nationality at the regional level (more details in Bover et al., 2019).

The information gathered in the survey is grouped into ten large sections. Table A1 in the Appendix lists the questions used. Section A of this table details the 10 questions of the ECF used to assess the financial competencies of the population evaluated. The financial expertise of individuals is assessed in relation to six financial concepts: inflation (3 questions), the compound interest rate, risk diversification (these three dimensions correspond to the *Big Three* proposed in Lusardi & Mitchell, 2006), the simple interest rate, the return/risk ratio and mortgages. To this are added two questions concerning the evolution of the profitability of investment funds.

Section B of Table A1 shows the ECF questions related to respondents' financial attitudes. In particular, our study aims to assess the importance of the following attitudes: short-sightedness (SS), risk aversion (RA), financial myopia (FM) and planning attitude (PA). We also include a financial vulnerability index (FV) that represents the self-perception of financial vulnerability.

Section C of Table A1 lists the ECF questions regarding the sociodemographic characteristics of the individual interviewed: age, sex, place of birth, educational level, occupational status, and income level.

3.2 | Dependent variable: The financial literacy of the Spanish adult population

This section presents a summary of the level of financial literacy of the Spanish population, using the information provided by the ECF. The analysis focuses on an index compiled from the ECF questions aimed at approximating FL. Specifically, this index (FL10 hereinafter) has been constructed from the number of correct responses to the questions formulated in the ECF to measure the financial knowledge of the population (the 10 questions that appear in block A of Table A1).

The results of the ECF show that the level of financial literacy of Spanish adults is very low. This situation is however similar to that found in other countries where analyses of this issue have been performed (and is regardless of whether the country in question is highly developed economically, such as the United States, Germany or France, or is an economically developing country, such as Thailand, Colombia or Malaysia).⁴

As [Graph 1](#) shows, only 5.1% of the respondents were capable of correctly answering the 10 questions that make up the FL index and only 14.7% were able to correctly respond to five of them.

[Graph 2](#) shows the distribution of answers (correct responses, mistakes, do not know/do not answer) to each of the questions constituting the FL10 index.

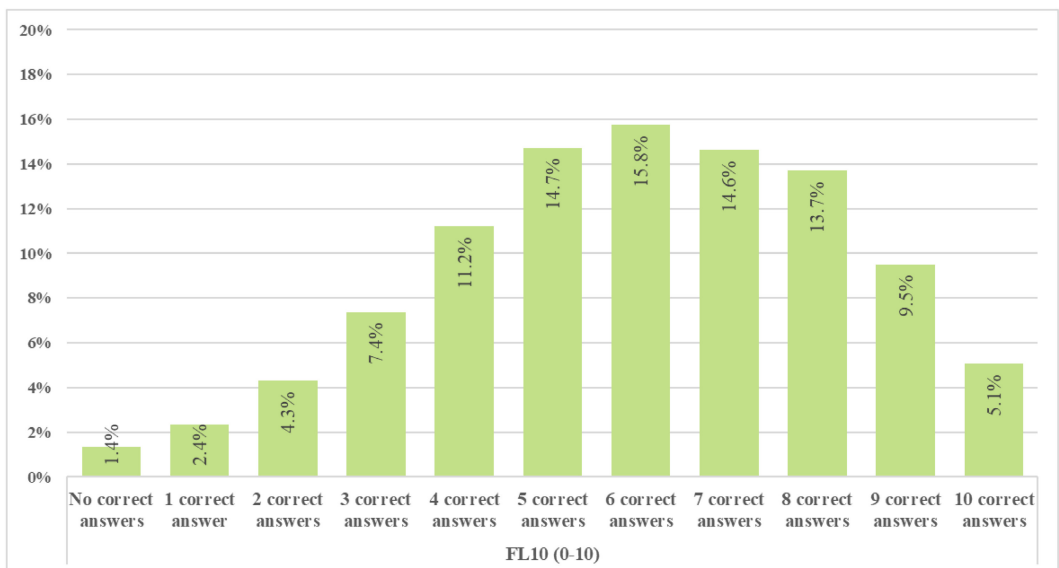
As can be observed, only 53.6% of the respondents are able to answer correctly the most elementary financial question (on simple interest). Of the *Big Three* proposed by Lusardi and Mitchell (2006) (understanding of inflation, compound interest and risk diversification), that with the highest level of correct responses concerns the understanding of inflation (58.2% of individuals respond correctly) and that with the lowest rate of correct responses regards the compound interest rate (only 45.7% of those surveyed answered correctly). Also of note is the lack of knowledge of the importance of portfolio diversification in reducing investment risk. In this case, only 48.5% adequately answered the question posed, with the response percentage “do not know /do not answer” being the highest of all the questions on FL (over 50% of respondents). This is extremely worrying, as it calls into question the population's ability to configure low-risk investment portfolios.

In the case of other financial competencies, the conclusion is similar. The highest rate of correct responses is to the question which relates investment profitability to risk (83%), while the lowest rate of correct responses (31.7%), is that relating inflation to the mortgage interest rate.

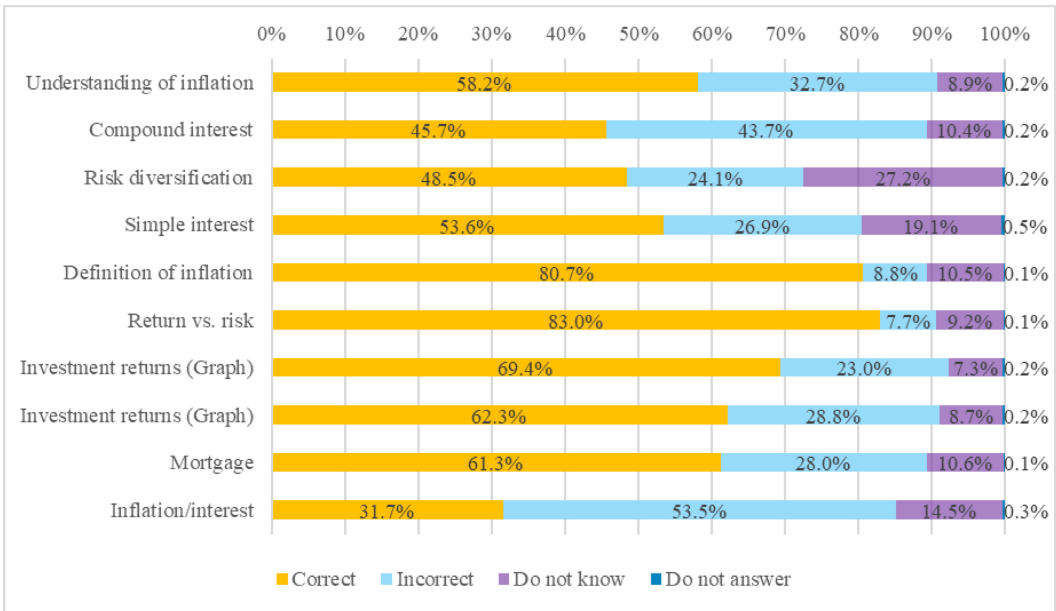
3.3 | Independent variables and correlations with FL

The choice of the independent variables is based on the review of the previous studies, reviewed above, and on the exploratory statistical analysis of the survey variables (cross tables, the statistical dependence test, polychoric correlations and the study of multicollinearity).⁵

Consequently, the independent variables included in our analysis are those in sections B and C of [Table A1](#) in the Appendix. Their descriptive values are described in [Table A2](#) in the Appendix. Apart from the



GRAPH 1 Percentage of correct responses to the 10 questions constituting the FL10 index. Source: Authors' compilation, employing information from the ECF (2016).



GRAPH 2 Distribution of responses to each of the questions constituting the FL10 index. Source: Authors' compilation, employing information from the ECF (2016)

socio-demographic variables that are usually included among the determinants of FL, our study incorporates, as already noted, information on various financial attitudes and financial personality traits.

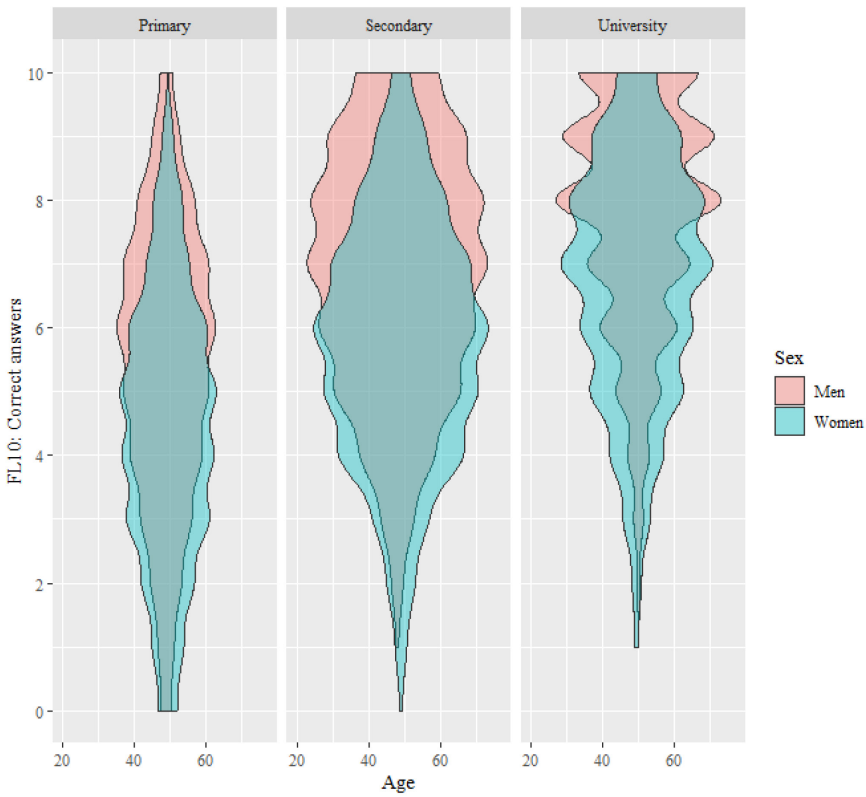
The association between some of the socio-demographic variables (section C in Table A1) and the FL is described immediately below.

As Graph 3 shows, the number of correct answers increases with the level of education achieved. This, moreover, is accentuated in the case of men. Age combined with education and gender conditions the number of correct answers at lower levels of education. Graph 3 also indicates that the lower number of correct answers is more equal in men and women at the lowest educational level than at other educational levels. The effect of the transition from high school to university education on the number of correct answers is more pronounced for women than for men.

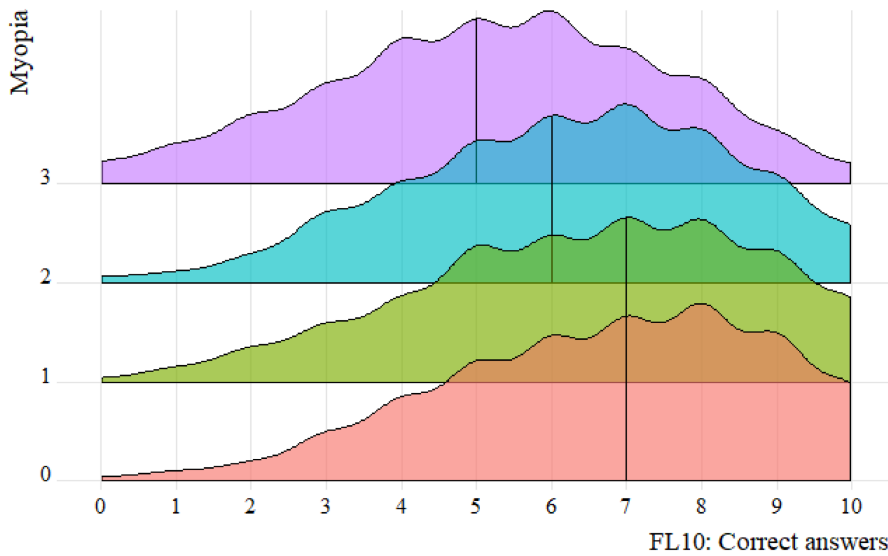
Concerning financial attitudes and financial personality traits, these are proxied by the variables in section B of Table A1 in the Appendix. Graphs 4–6 show the relationship between some of these variables and FL (the straight black line marks the median). As can be seen in Graph 4, there are no considerable differences in FL, in general, for financial myopia levels 0 and 1, but the median for level 3 is 5 while for levels 0 and 1 this is 7. We can see a shift in the bulk of the observations when moving from a myopia level of 0 to a myopia level of 7 (maximum myopia level). In other words, individuals with higher levels of financial myopia are more likely to give fewer accurate responses.

Concerning the relationship between FL and financial vulnerability, Graph 5 permits the grouping of the observations into three sections. The first, indicating a low level of financial vulnerability, has a median of 7 hits. The next, with levels of financial vulnerability between 2 and 4, shows a lower level of hits, while the next bracket, with a median number of hits around 5, corresponds to the highest levels of financial vulnerability (between 5 and 7). This is to say, greater financial vulnerability is associated with lower financial literacy.

The direct relationship between risk aversion and FL is shown in Graph 6. Given that we were unable to find a direct pattern between the two variables, we decided to analyse its effect in conjunction with other variables, through factor estimation, as shown in the model presented in the results section.



GRAPH 3 Number of correct answers by age, sex and level of education achieved.



GRAPH 4 Density of correct answers by financial myopia level (maximum level=3). Black line is the median.

3.4 | Methodology

The first step in estimating the results consisted of cleansing the data provided in the ECF. Part of this involves redefining and recoding some variables. However, the most important task in preparing the data was the imputation of missing values. This task is very important because if an imputation algorithm is not applied, it would mean a loss of 15.8% of cases in our regressions and could introduce biases in the estimates and a lower robustness of the results. Consequently, we selected a mixed procedure for the imputation of missing values which combines various simple imputation methodologies, respecting the typology of each variable to be imputed and the percentage of missing data this presented. A group of variables, characterized by their qualitative nature and their low percentage of missing data, was imputed through a *hot-deck* procedure which consists of the identification of donors with characteristics common to receivers with missing data. To those variables with a higher percentage of omitted data a regression imputation method was applied, specifying a model in which the covariables were strongly correlated with the variable to be imputed. In summary, the nature of each of the variables to be imputed (binary, multinomial, linear, censored, etc.) determined the concrete regression method selected.⁶

Once the database was prepared, the next step in our analysis was the estimation of the regression model that would allow us to identify the determining factors of the population's FL.

The fact that our dependent variable (FL10 index) is a count variable (its values have been determined, as explained in the previous section, from the number of correct responses to the 10 questions posed in the ECF), led us to select as estimation method a model of count data, specifically the Poisson model (MRP). This model has a number of advantages over an ordinary linear regression model, including a skew, discrete distribution for the dependent variable, and the restriction of predicted values to non-negative numbers⁷ (Agresti, 2001). A Poisson model is similar to an ordinary linear regression, with two exceptions. First, it assumes that the errors follow a Poisson, not a normal, distribution. Second, rather than modelling Y as a linear function of the regression coefficients, it models the natural log of the response variable, $\ln(Y)$, as a linear function of the coefficients.

MRPs have a systematic component, a random component, and a link function:

- Systematic component $\eta_i = \log(\mu_i) = x_i\beta$;
- The unexplained variability of Y follows a Poisson distribution, $\varepsilon \sim \text{Poisson}(\mu)$
- The link function that relates η to μ , $g(\mu_i) = \log(\mu_i)$.

The success count y_i follows a Poisson distribution with mean μ_i ,

$$\mu_i = E(y_i | x_i) = \exp(x_i\beta)$$

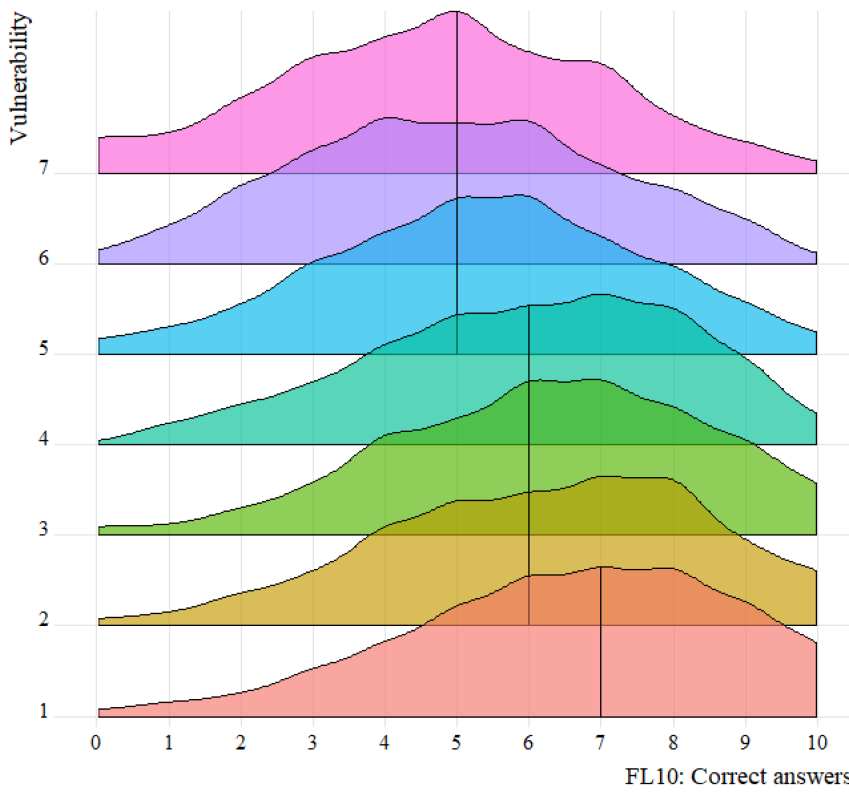
Using the exponential function, we obtain $\mu_i \geq 0$, the property of the measurement scale of count variables. The function $\mu_i = \exp(x_i\beta)$ is a multiplicative expression, essential in this case, since count data models include non-linear relationships between variables. This enables β to be interpreted directly:

$$\mu_i = \exp(x_i\beta) = \mu_i = E(y_i | x_i) = \exp(\beta_0 + \beta_j X_j) = \exp(\beta_0) * \exp(\beta_j X_j)$$

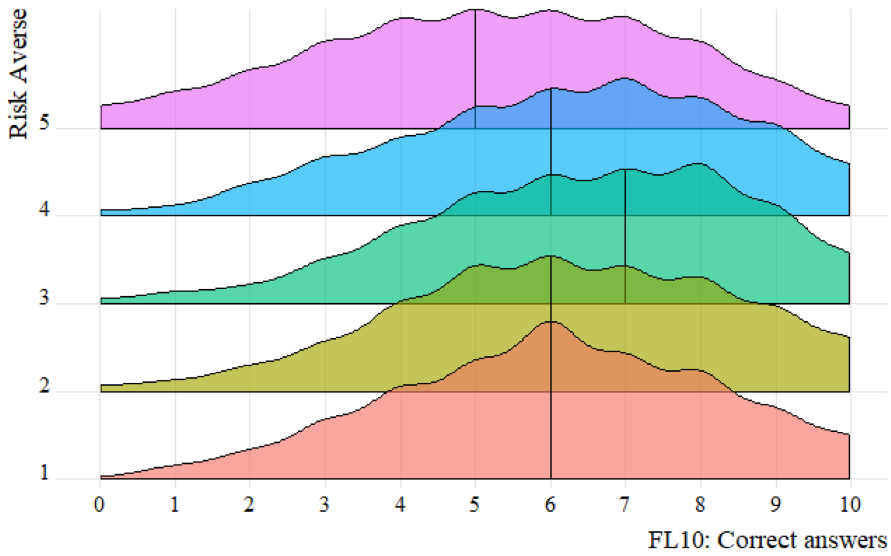
Given the high number of observations (8554), it was decided to apply a Poisson model of latent classes (LC) that takes into account the heterogeneity of the sample. These models were initially introduced by Lazarsfeld and Henry (1968) as a way of formulating latent attitudinal variables from dichotomous survey items. These models assume that the latent variable is categorical.

The expression of the Poisson distribution for latent classes is:

$$P(y_{it} | x, z_i, e_{it}) = \frac{1}{y_{it}!} (\theta_{t,x,z_i}, e_{it})^{y_{it}} \exp(-\theta_{t,x}, e_{it}) = \frac{1}{y_{it}!} (\mu_{t,x,i})^{y_{it}} \exp(-\mu_{t,x,i})$$



GRAPH 5 Density of correct answers by financial vulnerability (maximum level=7). Black line is the median.



GRAPH 6 Density of correct answers by risk aversion (maximum level=5). Black line is the median.

where z_i is the vector of exogenous variables, x refers to the latent classes, θ_{t,x,z_i} denotes the Poisson rate and e_{it} the exposure⁸ of case i to event t .

The estimation of the latent class Poisson model is very useful for analysing the effects detected in the general Poisson model between the different population groups grouped in the classes estimated.

TABLE 1 Discrete factor loadings of financial attitudes and financial personality traits (LCFA analysis).

Indicators	Factor1	Factor2	Factor3
Short-sightedness (SS)	-0.0969	0.0470	0.4083
Planning attitude (PA)	0.6152	-0.3535	-0.0745
Risk aversion (RA)	-0.1926	0.6701	-0.0567
Financial vulnerability perception (FV)	0.0169	0.1525	0.5310
Financial myopia (FM)	-0.0446	0.2381	0.4137

4 | RESULTS

The empirical specification of the latent Poisson model includes as dependent variable the FL10 index and, as independent variables and as already noted, several sociodemographic variables and several financial attitudes and financial personality traits.

Given that statistically significant correlations were detected among financial attitudes and financial personality traits, we chose to include them as latent variables, taking into account the ordinal character of the data, grouping their common sources of variation through the latent class factor analysis (LCFA) proposed by Magidson and Vermunt (2003).

The optimal LCFA model is a 3-factor model, each having two levels. Table 1 shows the loadings for each factor.

Factor 1 obtains the highest loading in the planning attitude (PA) variable, which indicates that individuals with a high factor 1 value are particularly characterized by their planning of long-term financial objectives.

Factor 2 mainly represents risk aversion (RA). Individuals with a high value for this factor are, compared to the rest, especially risk-averse individuals.

Finally, Factor 3 gathers information related to the self-perception of financial vulnerability (FV), short-sightedness (SS) and financial myopia (FM). Individuals with a high value of factor 3 are, therefore, people who consider themselves to be very vulnerable financially, who tend to live day to day and who do not correctly perceive the future value of money.

These three factors constitute the variables to be incorporated into the regression, in order to assess the effect of financial attitudes and financial personality traits upon FL.

The results obtained in the estimation of the Poisson model are presented in this section and are used to identify the drivers of FL. First, the results of the Poisson model without classes are presented. Next, the results of the model with latent classes are given.

The results obtained in the estimation of the Poisson model without classes are presented in Table 2.

As shown, the financial skills of the Spanish population are determined in a statistically significant way by gender (men have higher FL than women), place of birth (those born outside Europe have lower FL), educational level (a higher educational level means higher FL), age (an inverted U-shaped effect: the youngest and the oldest are those who display lower financial skills), and household income (positive relationship with FL). The results in Table 2, regarding the effect of the occupational status of the individual, indicate that self-employed workers are those with a higher probability of correct responses in the questions related to FL, something that is unsurprising given that such workers are likely to face financial decisions on a daily basis in the exercise of their activity.

Another result that should be highlighted is the positive and statistically significant relationship, as expected, between FL and individuals who have worked in the financial sector or those who have studied Business Studies.

Our analysis also reveals that FL is conditioned by the financial attitudes analysed in our study. In particular, the estimates in Table 2 show a negative effect on FL of the three factors reflecting such attitudes. Thus, financially myopic and short-sighted individuals who perceive themselves as highly vulnerable in financial terms (a high value of factor 3) show a negative and statistically significant relationship with FL. The result is unsurprising, since these individuals (those who are in the ECF indicate that they tend to live day to day, without thinking about the future, preferring a fixed amount of money in the short term compared to a much higher amount after a year, and

TABLE 2 Estimations of the Poisson group model.

Variable	Coefficient
Intercept	1.1731***
Financial attitudes	
Factor 1	-.0245***
Factor 2	-.1305***
Factor 3	-.1147***
Woman	-.0711***
Age	.0162***
Age-squared	-.0002***
Place of birth	
Spain	.0293***
Europe	.0099***
Rest of the world	-.0392***
Educational level	.1149***
Business studies	.0089***
Financial employment	.0334***
Occupational status	
Self-employed	.0507***
Employee	-.0047***
Unemployed	-.0003***
Retired	.0214***
Other inactive	-.0671***
Income	.0530***

Note: Pseudo R^2 : .33; $N=8554$.

***Significant at 1%.

have the perception that their assets would be depleted quickly if they ceased to receive their usual income) are those who foreseeably have little interest in financial issues.

The results of the model indicate that the effect of risk aversion (factor 2) means that more risk-averse individuals have a higher probability of being financially illiterate. This result can be explained by the fact that a greater propensity for risk can lead an individual to invest in less secure assets, for which it is essential to have a stronger background in financial matters.

The effect of factor 1 (which proxies a planning attitude towards finances) also displays a negative and statistically significant effect on financial skills, although the value of the coefficient of this variable is much lower than those of factors 2 and 3. Therefore, risk aversion, short-sightedness and the self-perception of financial vulnerability are the attitudes most closely related to low financial skills.

Given these results, we proceeded to analyse whether these conclusions hold true for all the individuals co-existing in the sample or whether they diverge among segments of individuals with different socio-demographic characteristics. The Poisson model of latent classes helps us to answer this question. Its estimates are shown in Tables 3 and 4. Table 3 shows the profiles of the classes estimated by the model. Table 4 lists the estimated coefficients, along with their level of significance.⁹ As shown, the best model with latent classes enables the population to be segmented into 5 classes. Each one groups together individuals with similar financial skills (the number of correct responses) based on the coefficients of the covariates estimated in the model, which are given in Table 4.

TABLE 3 Profile of classes for FL10.

	Class1	Class2	Class3	Class4	Class5
Class size	0.3718	0.3225	0.2263	0.0655	0.014
Correct response—Mean	6.0367	8.3958	3.9131	1.7644	0.0274
Women	0.5197	0.3472	0.6265	0.6532	0.6339
Age					
17–31	0.2537	0.1401	0.2038	0.1855	0.1202
32–41	0.2088	0.2247	0.1645	0.1467	0.0503
42–51	0.2057	0.2679	0.1735	0.0988	0.0895
52–62	0.1705	0.2194	0.1883	0.1559	0.2084
63–80	0.1614	0.1479	0.2698	0.4131	0.5316
Mean (age)	44.2835	46.9413	48.833	52.9025	59.8775
Place of birth					
Born in Spain	0.8641	0.9214	0.8509	0.8092	0.914
Born in Europe	0.0368	0.0387	0.0409	0.0337	0.0101
Born in rest of the world	0.0991	0.0398	0.1082	0.1572	0.0759
Educational level					
Primary	0.4271	0.1906	0.6573	0.8167	0.9628
Secondary	0.2575	0.2416	0.1974	0.1105	0.0372
University	0.3155	0.5678	0.1452	0.0728	0
Business studies	0.054	0.1354	0.0235	0.0031	0
Financial employment	0.0669	0.1291	0.0204	0.0077	0
Occupational status					
Self-employed	0.1342	0.1432	0.044	0.0617	0.0217
Employee	0.4233	0.5265	0.3541	0.2214	0.1434
Unemployed	0.1498	0.1014	0.1665	0.1409	0.1049
Retired	0.1417	0.1372	0.1966	0.2645	0.3296
Other inactive	0.151	0.0917	0.2388	0.3114	0.4004
Income					
Under 9000€	0.1297	0.052	0.2269	0.3465	0.4964
9001–14,500€	0.2377	0.1028	0.3116	0.3734	0.3053
14,501–26,000€	0.3076	0.25	0.2887	0.2122	0.1751
26,001–44,500€	0.2205	0.3198	0.1341	0.0546	0.0231
44,501–67,500€	0.1045	0.2754	0.0387	0.0133	0

As can be deduced from Table 3, class 2, with 32% of the population, consists of mainly men (over 65%), aged between 32 and 62, with university-level studies, enjoying a high income (over €26,000), with a considerable percentage of active workers (14% self-employed and 53% employees), including a substantial presence of individuals having business-related education (13%) and employment in the financial sector (13%) and a very low percentage of individuals born outside Europe (4%). Individuals belonging to this class have the highest mean of correct responses in the sample (8.39 out of 10). By contrast, classes 4 and 5 (which group only 8% of individuals) are made up of a majority of women (more than 60% in each case), with age groups over 52, only primary education, inactive professionally and with the lowest family income in the sample (less than €14,500 per year). The individuals who

TABLE 4 Estimates of the Poisson model of latent classes.

	Class1	Class2	Class3	Class4	Class5
Class size	0.3718	0.3225	0.2263	0.0655	0.0140
Intercept	1.8760***	2.1803***	1.5047***	0.6785***	-21.1694***
Financial attitudes					
Factor 1	-0.0237***	-0.0190***	0.0278***	-0.0009	13.0608***
Factor 2	-0.0624***	-0.0700***	-0.1635***	-0.1055***	-7.2078**
Factor 3	-0.1205***	-0.0910***	-0.1742***	-0.1186***	9.0179***
Covariables					
Intercept	1.2181	-4.1820***	1.8796**	2.6959***	-1.6115
Woman	-0.0341***	-0.5553***	0.2150***	0.2688***	0.1056***
Age	0.0380***	0.1480***	0.0113***	-0.0813***	-0.1161***
Age-sq	-0.0006***	-0.0015***	-0.0002***	0.0009***	0.0013***
Place of birth					
Spain	0.0319**	0.2311***	-0.1200***	-0.3281***	0.1850***
Europe	-0.0500*	0.1929***	0.1254***	0.0331	-0.3013***
Rest of the world	0.0182	-0.4240***	-0.0054	0.2949***	0.1163**
Educational level	0.5572***	1.1729***	0.0841***	-0.2171***	-1.5970***
Business studies	0.4860	0.7602	0.5082	-0.1156	-1.6387
Financial employment	1.0156	1.1302**	0.5682	0.2379	-2.952
Occupational status					
Self-employed	0.3636***	0.2766***	-0.4134***	0.1784***	-0.4052***
Employee	-0.1080***	-0.0620***	0.1205***	-0.0884***	0.1383***
Unemployed	-0.0217	0.0480***	0.1527***	-0.0784***	-0.1007**
Retired	0.1555***	-0.1119***	0.1348***	-0.0567***	-0.1217***
Other inactive	-0.3890***	-0.1508***	0.0054	0.0451***	0.4893***
Income	0.2583***	0.5786***	0.0471***	-0.2789***	-0.6051***

Note: Pseudo R^2 : .94.

***Significant at 1%; **Significant at 5%; *Significant at 10%.

present a very low number of correct responses to the questions on financial competences belong to these classes (1.7 and 0.02, respectively, out of 10), and consequently are the classes that group together the most financially illiterate. The profile of the individuals in these two classes is very similar to that of class 3, where the number of correct responses to the questions that reflect financial skills, although greater than that of classes 4 and 5, is clearly very low (4 correct responses out of 10).

Individuals in class 1 have a similar profile to that of class 2, except that the gender distribution of the former is more egalitarian, the average age is lower, it comprises very few individuals with business studies or employed in the financial sector, a lower educational profile, more inactive workers, and lower income levels. This class occupies second place in terms of the number of correct responses to the questions that reflect FL.

The characterization of the classes performed by the model allows the Spanish population to be divided into five types of individuals, based on their FL and their sociodemographic characteristics: those in classes 1 and 2, who display greater financial skills and include a greater proportion of males, with university studies, higher incomes, who have studied business and are actively employed; and those of classes 3, 4 and 5, with the lowest financial skills and where women predominate, with a high average age, low educational level and low income. In these three classes, moreover, there is a higher proportion of individuals born outside Europe.

We now examine the relation of financial attitudes (factors 1, 2 and 3) and FL for each of the 5 population classes described immediately above, by considering the coefficients obtained for each class in the estimations of the Poisson model of latent classes shown in [Table 4](#).

As shown, the effect of factors 1, 2 and 3 is statistically significant in practically all the classes (the exception is factor 1 in class 4), although the direction and magnitude of the effect varies.

Thus, for individuals who show the greatest financial abilities (class 2), the effect of the three factors is highly significant and negative, giving results that are similar to those obtained in the Poisson model without classes. The factor with the highest coefficient for this class is factor 3. This indicates that, for individuals in this class who are more short-sighted, myopic in financial terms and with a high perception of financial vulnerability, the likelihood of possessing stronger financial skills decreases.

In class 1, the largest group (37%) and the second in number of correct responses (6 out of 10), the 3 factors also show an inverse relationship with financial skills, although with different nuances to class 2. For class 1, factor 2 is that with the highest coefficient; that is to say, in class 1 (where there are comparatively fewer highly educated individuals, lower gender parity, very few individuals with education or occupation related to finance), the attitude most strongly related to FL is risk aversion.

In classes 3 and 5 (made up mostly of women with a low cultural and professional level, low income levels and significant financial illiteracy), factor 1 shows a positive and statistically significant effect. Specifically, in class 5, which has the lowest mean number of correct responses (approximately 0) and is the least numerous class in the study (1.4%), factor 1 is that with the highest coefficient; that is to say, the individuals in this group, more prone to plan, give a greater number of correct responses.

Finally, in class 4, comprising mainly women younger than those in class 5 and with a greater presence of those born outside Europe, only factors 2 and 3 are significant and with a negative effect. This indicates that in this segment risk aversion and FL are highly related. Likewise, individuals who are less vulnerable and less short-sighted in financial terms and those who are less short-sighted in their financial decisions have a greater probability of being more financially literate.

5 | CONCLUSIONS AND DISCUSSION

Since the most recent recession of 2008, studies of financial literacy have multiplied rapidly in the international context, especially in the United States. Most of them have focused on analysing the economic consequences of FL, but there are also many which have tried to identify the drivers of financial skills. These latest studies are unquestionably useful for obtaining information on the aspects most strongly affecting the improvement of such skills.

Our study represents an innovative contribution to this literature, proposing certain novelties with regard to previous work. On the one hand, it focuses its attention on Spain, a country in which the subject of FL has only rarely been studied, especially in the context of the adult population. On the other hand, the empirical estimates have been made with a Poisson model, an ideal choice when the variable to be explained is a count variable, namely a variable that can take only non-negative integer values $\{0, 1, 2, 3, \dots\}$, and where these integers are produced by counting rather than ranking. Finally, our study explores the relationship between FL and certain financial attitudes, a topic barely researched to date.

Our results confirm that the level of FL in Spain is very low, a situation similar to that of many neighbouring countries. The financial concept most familiar to Spaniards is inflation, although only a minority of respondents are able to understand the relationship between inflation and the interest rate for mortgages. Compound interest is understood by only a minority of individuals. The results also highlight the lack of knowledge of the importance of portfolio diversification in reducing investment risk. In this case, only 48.5% adequately answered the question posed, with the percentage of responses "I don't know" being the highest of all the questions on FL.

Our study has identified that the drivers of FL in the Spanish population as a whole include gender (men have greater financial skills than women), place of birth (those born outside Europe have lower FL), educational level (a higher educational level means higher FL), age (an inverted *U*-shape: the youngest and the oldest are those who display less financial skills), occupational status (the self-employed group shows greater FL) and household income level (a positive relationship with FL). These results are consistent with those obtained in the majority of studies performed on the subject in the international context.

Our analysis also reveals an association between FL and certain financial attitudes and financial personality traits (planning, risk aversion, financial myopia, short-sightedness and self-perception of financial vulnerability).

In addition, we demonstrate that the relationship between these attitudes and FL varies for different population groups, something unexplored in previous studies. This result, obtained by estimating a count model with latent classes, is indisputably important for the design of possible intervention policies aimed at improving the FL of the population, since it highlights that when financial training programs are implemented, they should take into consideration the FL levels and the sociodemographic composition of the target individuals.

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CONFLICT OF INTEREST STATEMENT

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

DATA AVAILABILITY STATEMENT

Data will be made available on request. The data used in this research come from the Spanish Central Bank and are available free of charge (prior registration required) on its website (https://www.bde.es/bde/es/areas/estadis/estadisticas-por/encuestas-hogar/relacionados/encuesta-de-comp/ECF_2016.html).

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ENDNOTES

¹The Secretary General of the OECD has pronounced in this regard, pointing out that financial education can crucially change the lives of citizens, determining their opportunities and achievements and favouring entrepreneurship, social mobility and inclusion (OECD, 2017).

²The second wave is currently in progress. To the best of our knowledge, few papers have used the ECF until now. These are those of Álvarez-Espino et al. (2020), Arrondel et al. (2020), Mancebón and Ximénez-de-Embún (2020), Hospido et al. (2021), Oliver-Márquez et al. (2021), Rey-Ares et al. (2021) and Oliver-Márquez et al. (2023).

³According to the latest (2017) data published by the World Bank, 28.3% of youths in the OECD between 15 and 24 possessed a credit card, this figure being 18% among the Eurozone countries (25.4% for Spain). This figure is even higher if possession of a financial institution account or a provider of mobile payment services is taken into account. In this latter case, the percentage of youths between 15 and 24 who make use of these services is 83.5%, in the OECD countries, slightly above the average for the Eurozone countries (79.1%) (in Spain this figure is 65.3%). See <https://databank.worldbank.org/source/global-financial-inclusion/Series/fin7.t.a.3> and <https://databank.worldbank.org/reports.aspx?source=2&series=FX.OWN.TOTL.YG.ZS&country=>

⁴See the studies by Lusardi and Mitchell for the United States or the report by the OECD (2020).

⁵The exploratory statistical analysis is available under request.

- ⁶Despite multiple imputation methods being widespread today, the literature includes situations in which simple imputation methods produce satisfactory results, on occasion even more efficient than those of multiple imputation (Durrant, 2005). If use is made of data from complex surveys, in which the percentage of missing data is low, as in our case, it is likely that a simple imputation method will better reproduce the characteristics of the subpopulation of interest than an algorithm which considers the entire sample.
- ⁷Given that the Poisson model is a restrictive model (conditional on equality of mean and variance), it is necessary to check whether there is overdispersion by applying any one of the statistical tools available. The present study verifies the absence of dispersion from tests based on regression, applying the test proposed by Cameron and Trivedi (1990).
- ⁸In studies in which the observations take place in a non-homogeneous context (in space or time) the values of the explanatory variables, such as exposure to the questions in the questionnaire, inclusion of the exposure variable is recommended.
- ⁹Estimations of all the models have been carried out using the program Latent Gold 6.0®.

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APPENDIX A

TABLE A1 Variables included in the Survey of Financial Competences (ECF) 2016.

A: Questions to proxy FL

Knowledge regarding inflation (0) incorrect response; (1) correct response

Question 1: Effect of inflation: Imagine that five brothers had to wait one year to obtain 1000 euros and that inflation in that year was 1%. In one year they will be able to purchase: (a) more than they would be able to buy today; (b) the same; (c) less than they would be able to buy today; (d) it depends on the type of things they wish to buy; (e) do not know/do not answer

Question 2: Relation of interest and inflation: Which group would be able to benefit most from an unexpected increase in inflation? (a) a household which has a fixed interest rate mortgage; (b) a bank which has granted a fixed interest rate mortgage; (c) a household which lives from the revenue from fixed income assets (d) do not know/do not answer

Question 3: Concept of inflation: High inflation means that the cost of living is increasing rapidly (true/false)

Question 4: Simple interest (0) incorrect response; (1) correct response

Let us suppose that you deposit 100 euros in a savings account with a fixed annual interest rate of 2%. If you make no further deposits nor withdraw any money, how much money will there be in the account at the end of the year?

Question 5: Compound interest (0) incorrect response; (1) correct response

Again, if you make no further deposit nor withdraw any money, once the payment of interest has been made, how much money will there be in the account after five years?

Question 6: Risk/return: True/false question

It is likely that an investment with a high rate of return is also high risk

Question 7: Risk diversification. True/false question

In general, it is possible to reduce the risk of investing in the Stock Exchange by purchasing a wide variety of shares. (a) true; (b) false

Question 8: Mortgages. True/false question

A 15-year mortgage normally requires monthly payments higher than a 30-year mortgage, but the total interest paid during the life of the loan will be lower

Questions 9 and 10: Evolution of the return from an investment fund (2 questions)

Two questions are asked in which the interviewee is shown a graph with the evolution of the value of three investment funds in which 10,000 euros were invested six years ago and they are asked which fund obtained the best performance when six years have elapsed

(Continues)

TABLE A1 (Continued)

B: Questions to proxy financial attitudes

Short-sightedness (SS): Respondents are asked for their complete disagreement (1) to complete agreement (5) with the following item: I tend to live day by day

Risk aversion (RA): Respondents are asked for their complete disagreement (1) to complete agreement (5) with the following item: I am willing to take risks when I invest (the value of the answers is inverted for the attitude to risk aversion)

Financial myopia (FM): The variable "myopia" is constructed from the answers to the ECF that ask respondents the following:

- a. d0300: Suppose you were offered €2000 today. However, if you waited a year, you would be offered €2200. In both cases, you would be fully certain to receive the money. What would you choose: €2000 today (1) or €2200 in a year's time (0)?
- b. d0400: Now suppose that, if you waited a year, you would be offered €3000. In both cases, you would be fully certain to receive the money. What would you choose: €2000 today (1) or €3000 in a year's time (0)?
- c. d0500: Now suppose that, if you waited a year, you would be offered €2100. In both cases, you would be fully certain to receive the money. Which would you choose: €2000 today (1) or €2100 in a year's time (0)?

The key idea behind myopia is to capture present-biased preferences in which extra value is placed on more immediate rewards. We define the variable "myopia" values as:

- 0 if the answer to question d0300 is 0 and the answer to question d0500 is 0.
- 1 if the answer to question d0300 is 0 and the answer to question d0500 is 1.
- 2 if the answer to question d0300 is 1 and the answer to question d0400 is 0.
- 3 if the answer to question d0300 is 1 and the answer to question d0400 is 1.

In other words, a higher value is associated with a greater degree of myopia.

Planning attitude (PA): Respondents are asked for their complete disagreement (1) to complete agreement (5) with the following item: I have established long-term financial objectives

Self-perception of the degree of financial vulnerability (FV): Respondents are asked: If you ceased to receive the principal source of household income, for how long would you be able to meet your expenditure without having to request a loan or move home?: (1) less than a week; (2) more than a week, less than a month; (3) more than a month and less than three months; (4) between three and six months; (5) more than six months; (6) more than nine months; (7) more than a year (the value of the answers is inverted for this variable)

C: Questions to proxy demographic and socioeconomic situation

Gender: (0) Male; (1) Female

Place of birth: (1) Spain; (2) Europe; (3) Rest of the world

Age

Educational level: (1) Primary; (2) Secondary; (3) Higher

Business studies: (0) No; (1) Yes

Occupational status: (1) Self-employed; (2) employee; (3) unemployed; (4) retired; (5) other inactive

Financial employment: (0) No; (1) Yes

Household income: (1) Under 9000 €/year; (2) 9001–14,500 €/year; (3) 14,501–26,000 €/year; (4) 26,001–44,500 €/year; (5) 44,501–67,500 €/year; (6) Over 67,500 €/year

Source: Authors' compilation, using ECF 2016.

TABLE A2 Descriptive statistics.

Covariables	
Gender (female)	50.6%
Place of birth	
Spain	87.4%
Europe	3.8%
Other	8.8%
Age (mean)	46.9
Educational level	
Primary	43.5%
Secondary	22.5%
University	33.9%
Previous business studies (yes)	7.0%
Employment status	
Self-employed	11.0%
Employee	42.1%
Unemployed	14.1%
Other inactive	16.8%
Retired	16.0%
Job in financial sector	7.1%
Gross annual family income	
Under 9000 €/year	14.6%
9001–14,500 €/year	22.3%
14,501–26,000 €/year	27.7%
26,001–44,500 €/year	21.8%
44,501–67,500 €/year	8.8%
Over 67,500 €/year	4.8%
<i>Financial personality traits and vulnerability</i>	
Short-sighted (1–5)	2.2
Risk-averse (1–5)	3.2
Planner (1–5)	2.9
Financially myopic (0–3)	1.9
Financial vulnerability index (1–7)	3.2
N	8554