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# Financial literacy and financial well-being among generation-Z university students: Evidence from Greece

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## ABSTRACT

Financial knowledge has become an essential skill because of the instability of global markets, asymmetric information in those markets, increasing complexity of financial products, and the rapidly increasing growth in financial technology (Fintech). This study aims to be the first among its kind to evaluate the relation between financial literacy, financial fragility, and financial well-being in parallel with identifying their determinants. For this purpose, we design and distribute a questionnaire to a random sample of 456 university students in Greece. The university students represent Generation Z that experienced the effects of a unique in duration and consequences financial crisis. We analyze the data by using cross-tabulations, chi-square tests, logistic regressions, and a marginal effect analysis. The results show that male students, students who keep expense records, or their father is highly educated are more financially literate. We also examine the dimensions of financial fragility, and the results show that financially literate students are better able to cope with an unexpected financial shock. Thus, financial literacy can be a key driver of financial well-being among Greek university students. Furthermore, we discuss the likely policy prescriptions while accounting for related behavioral aspects and technological developments.

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## 1. Introduction

Financial literacy has become an essential skill that is required for everyday life around the world. Because of the instability in the global economy, consumers face financial decisions that have become more complex due to the increased variety of financial products and challenges. For this reason, the significance of financial management skills in personal life has increased and more studies have explored this issue in the last decade. The global financial crisis has highlighted the significance of financial literacy and the need for financial knowledge and education. Furthermore, financial literacy contributes to a financial attitude that leads to financial well-being. Having financial knowledge is the key element for making sound financial decisions and is essential to financial well-being.

Financial literacy is the ability to understand and analyze financial options, plan for the future, and to respond appropriately to events. This ability can influence the conditions of life and work and can be very helpful in anticipating the future to increase income. Unfortunately, despite the importance of financial literacy, the research has shown that this ability in people around the world, especially in developing and underdeveloped countries, is not substantial. These populations face barriers such as the complexity of financial life, the existence of many options when making decisions, and not having enough time and money to learn about personal finance issues.

Therefore, these barriers cause low financial literacy in developing countries (Vitt et al. 2000). Financially literate people can make sound financial decisions and therefore are more able to achieve their financial goals and to hedge themselves against economic shocks and their associated risks that eventually lead to financial well-being. The lack of financial knowledge is the main driver that pulls people away from financial markets, as shown by Lusardi and Mitchell (2006). Moreover, the participation of individual investors in the financial market is increasing day by day due to the introduction of new financial services and products. The complexity in dealing with integrated financial products has increased in the last few decades that hinders the ability to understand financial concepts like inflation, interest, compound interest, risk management, and its application. Lusardi and Mitchell (2011b) and Atkinson and Messy (2012) argue that the financial knowledge that people need to deal with advanced financial products and services is at its lowest level.

The global financial crisis has left its mark on many countries, with Greece still experiencing its aftermath. Greece is still experiencing the financial cost from both the 2008 global financial crisis and domestic structural problems, and the negative consequences have affected the country's economy and society in a severe way. Unemployment rose to the extraordinary rate of 27% in 2013, whereas wages in both the public and, even more, in the private sector have sunk by 40–60%. Greeks' household budgets have dropped by around 30%, while they have lost some €587 billion throughout the global financial crisis. Since 2000 when Greece became a member of EMU, a geometrically rising credit expansion was entrusted to the credit industry in Greece – with no restrictions due to the low levels of interest rates and expansive monetary policies. Lending unscrupulously inevitably led to over-borrowing that equally led to over-indebtedness. According to official data, the Greek public and private debt has reached €532.18 billion, with a government debt to GDP that averaged 99.51% between 1980 and 2017. It reached an all-time high of 180.80 percent in 2016. Household loans accounted for around 46.2% of total bank credit to the private sector in September 2016; two-thirds of which were housing loans. The NPE's ratio (nonperforming exposure) of Greek banks rose during the first half of 2016 to 45.1% (the highest in the EU) and the total NPEs reached €107.6 billion in the third quarter of 2016. However, if private investors had been better informed on personal financial matters, they might have acquired more sophisticated financial products through risk diversification and might have had smaller exposures to debt through mortgages and consumer loans. Nevertheless, the gross gaming revenues in Greece have doubled the average of 27 countries in Europe and have reached about €11 billion. The stark contrast of the figures above is likely to generate inferences related to the importance of investing in people's financial literacy through awareness programs, initiatives, and national campaigns, especially for the young population, in order to mitigate erroneous financial behaviors.

The purpose of this study is to be the first of its kind to evaluate the relation among financial literacy, financial fragility, and financial well-being in parallel to identifying their determinants. Our sample comprises university students in Greece who represent a generation that grew up in a unique – in duration and consequences – financial crisis, which was comparable only to the Great Depression of 1929. Conceptually, this generation is more likely to have higher levels of financial awareness. On the other hand, the absence of a national strategy on financial literacy in Greece does not facilitate the process of experiential learning from good and bad past experiences.

Following Andreou and Philip (2018), we investigate the relation between financial literacy, financial fragility and financial well-being. For this purpose, we designed and distributed a survey that uses a random sampling of 456 university students in Greece. There are several important findings which stem from our estimation approach. First, we show that male students, students who keep expenses-record, or those whose father is high educated are more financially literate. Second, we measure the levels of the students' financial fragility and their 'absolute' financial knowledge with control variables for demographics and socioeconomics. We show that financially literate students are better able to cope with an unexpected financial shock. Third, we investigate whether financial literacy is a key determinant of financial well-being. The results show that financial literacy and low levels of financial fragility are key drivers of financial well-being among Greek university students. Finally, we discuss the likely policy prescriptions, taking into account related behavioral aspects and technological developments.

Our study is different from the empirical studies already conducted in three aspects. First, to the best of our knowledge, none of these studies has estimated the levels of financial literacy, financial fragility, and financial

well-being in parallel with identifying the demographic and socioeconomic factors that affect these three financial components. Second, this study is the first of its kind in evaluating the relation between financial literacy, financial fragility and financial well-being. Third, we identify the lack of public policy actions to fight financial literacy in Greece and propose a holistic approach for financial education in Greece.

The study is organized as follows: in the next section, we discuss the related studies. In Section 3, we present the research method. Specifically, we present the survey instrument and the econometric method. In Section 4, we provide the statistics of our sample along with the empirical results from the econometric analysis. In Section 5, we discuss key policy actions in order to form a new generation of financially educated citizens along with a savings and effective culture to build financial awareness. The last section concludes the paper and suggests some unexplored avenues of research in the field.

## 2. Literature review

The complexity of financial decisions and the behavioral biases have threatened the quality of people's lives and have led to researchers investigating ways to deal with them. A focus on the young by examining financial literacy among students is an interesting starting point. Studies have shown that levels of financial literacy are low, especially among the young population and university students. Beal and Delpachitra (2003) survey 847 students of a regional Australian university with a substantial external student enrolment. They find that financial literacy is not high and this, no doubt, stems from the lack of financial-skill education in high schools. Xiao et al. (2007) survey 781 students at the University of Arizona and find that students who were in nonbusiness fields, those who were living in a campus dormitory, and those who received financial support had a low level of savings. Ergun (2018) analyzes the levels of financial literacy among university students in Estonia, Germany, Italy, Netherlands, Poland, Romania, Turkey, and the Russian Federation. Ergun examines 409 questionnaires, and the results show low levels of financial literacy among university students along with a strong relation between financial literacy and demographic characteristics. Andreou and Philip (2018) examine financial literacy and attitude as well as behavior among 881 university students in Cyprus. Their results show that 6.24% of the students answered all questions correctly with only 36.9% having good financial knowledge. By contrast, Chen and Volpe (1998) use data from 924 university students in 14 American universities and find that students who study business and economics had high levels of financial literacy. Furthermore, Oppong-Boakye and Kansanba (2013) use a sample of 203 undergraduate business students in Ghana. Their study finds that formal education is the major source of financial literacy for undergraduate students, followed by parents, the media, and peers. Sarigül (2014) survey 1,127 university students in Turkey. The results show that there is a strong relation between financial literacy and student characteristics. Albeerdy and Gharleghi (2015) investigate the factors that influence the financial literacy of university students in Malaysia and show that there is a significant relation between socioeconomic variables such as education and money attitude and the levels of financial literacy.

Shim et al. (2009) and Hogarth (2006) indicate that financial knowledge, financial fragility, and financial behavior affect financial well-being. Financial literacy develops a financial attitude that leads to financial well-being. They have found a strong positive relation between financial literacy and financial well-being. Joo and Grable (2004) show that an increase in financial literacy affects financial contentment which eventually turns into financial well-being. Klapper and Panos (2011) examine the relation between financial literacy and retirement planning in Russia. They find that only 36% of respondents in their sample understand interest compounding and only half can answer a simple question about inflation. In a country with widespread public pension provisions, they find that financial literacy is significantly and positively related to retirement planning that involves private pension funds.

Moreover, Gutter, Copur, and Garrison (2010) explore the relation between the financial behaviors and financial well-being of 15,797 college students in the US when controlling for demographic and financial characteristics and financial education and dispositions. The results show significant differences in the levels of financial well-being for various socioeconomic factors and financial behaviors. Chan, Chau, and Kim (2012) examine the relation between college students' money-related aptitudes, financial management practices, and financial well-being. Their findings confirm that students' tendency to engage in healthy financial management practices are related to attitudes toward debt, financial knowledge, and employment, while students who practice good

financial management tend to incur less debt and show better financial well-being. Finally, Sabri et al. (2010) and Falahati and Paim (2011) examine the relations between personal and family backgrounds, academic ability, childhood consumer experience, financial socialization, financial literacy, and perceived financial well-being of Malaysian college students. They show that financial literacy is related to financial well-being, while there are important differences between the Malay and Chinese ethnic groups in Malaysia.

### **3. Research methodology**

#### **3.1. Data collection**

According to statistics released by the Hellenic Statistical Authority for the academic year 2018–2019, there were 396,814 undergraduate students in all Greek universities. The survey used in this study covers 456 university students from Departments of Business Administration (55%) and Departments of Statistics and Insurance Science (45%). The data were collected through the use of a paper version that was self-administered. This research was conducted during the spring semester in 2016. Mostly senior students were targeted. Furthermore, the participation was optional and confidentiality measures were taken for personal data. Senior business school students were thought of as the primary group of interest due to more years of exposure to higher education and, specifically, business education.

#### **3.2. Survey instrument**

The survey instrument emphasized four pillars. The first pillar captures the demographic, parental, socioeconomic, and financial behavior characteristics of the participants. The second pillar emphasizes financial knowledge. The third pillar examines financial fragility, and the fourth pillar refers to financial well-being. Students were asked to answer 27 multiple-choice questions in total.

Specifically, the first pillar consists of 18 questions on participants' demographic characteristics, their parents' socioeconomic characteristics, their educational background, and some on their personal financial behavior as well as their perceptions of the effects of the financial crisis.

The second pillar includes five questions on numeracy (interest), compound interest, inflation, and risk diversification. The financial literacy pillar stems from five questions that define the levels of financial literacy of the students. These questions were based on the questions conducted by validated international financial literacy surveys in the literature, for example Lusardi and Mitchell (2014), Klapper, Lusardi, and Panos (2013) and Lusardi and Mitchell (2006). In order to define a 'Financially Literate' student we use three alternative scenarios. The first scenario indicates that a student is 'Financially Literate' when he or she correctly answers at least four questions. The second scenario indicates that a student is 'Financially Literate' if he or she correctly answers all these questions. The third scenario indicates that 'Financial Literacy' is an ordinal variable that denotes the number of respondent's correct answers.

The third pillar examines students' financial fragility in the sense of being exposed to an unexpected financial shock. Fragility was measured with a similar question those in Lusardi, Schneider, and Tufano (2011). Thus, we asked university students: 'How confident are you that you could come up with €300 if an unexpected need arose within the next month?' However, the amount of an unexpected shock was significantly reduced in order to be commensurate with students' allowance or income. This is in contrast with Lusardi, Schneider, and Tufano (2011) who asked for an amount of \$2000. We define as 'Financially Fragile' a student who answered that 'I'm sure that I couldn't come up' or 'Maybe I couldn't come up' with €300 if an unexpected need arose in the next month.

The fourth pillar examines the perceived students' financial well-being in the sense of one's attitude toward financial status. It was measured using two questions adapted from Hira and Mugenda's (1999a, 1999b) measure of financial satisfaction: money saved and the current financial situation. These questions were thought of as relevant to the Greek economic environment and the Greek way of life. Therefore, we asked university students: 'Do you cover everyday expenses?' and 'If they are saving for long term'. We define a student as having a 'High

level of Financial Well-being' if he or she responds that 'Most of the times' or 'Always I can cover everyday expenses' and 'Regularly' or 'Rarely' saves for the long term.

### 3.3. Empirical strategy

The main purpose of this study is to measure the levels of financial literacy, financial fragility, and financial well-being. First, we analyze the descriptive statistics of the variables included in the dataset. Second, we test the existence of dependencies between the financial literacy and sociodemographic variables along with the relation among financial literacy, financial fragility, and financial well-being by using the statistical Pearson  $X^2$  test for independence (Pearson 1900). The chi-square test of independence determines whether there is an association between the categorical variables (i.e. whether the variables are independent or related).

Third, we use logistic regression models to determine the linkages between financial literacy, financial fragility, and financial well-being with a number of respondents' demographics, parental, and socioeconomic characteristics.<sup>1</sup> Logit( $p$ ) is the log of the odds ratio  $p/(1-p)$  or likelihood ratio in which the dependent variable is one. In symbols, it is defined as:

$$\text{logit}(p) = \log \frac{p}{1-p} = \ln \frac{p}{1-p} \quad (1)$$

where  $p$  is the probability that a case is in a particular category.  $p$  can only range from zero to one where one denotes the probability of success. The logit( $p$ ) scale ranges from negative infinity to positive infinity and is symmetrical around the logit of 0.5 (which is zero). The formula below shows the relation between the usual regression equation ( $a + bx \dots$  etc.), which is a straight line formula, and the logistic regression.

The form of the logistic regression is:

$$\log(p(x)) = \log \left( \frac{p(x)}{1-p(x)} \right) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots \quad (2)$$

in which  $p$  is the probability that a case is in a particular category,  $\beta_0$  is the constant of the equation, and  $\beta_i$  are the coefficients of the predictor variables. Equation (2) looks just like a linear regression and although the logistic regression finds a 'best fitting' equation, just as a linear regression does, the principles on which it does so are rather different. Instead of using a least squared deviations for the best fit, it uses the maximum likelihood which maximizes the probability of getting the observed results given the fitted regression coefficients. A consequence of this method is that the goodness of fit and overall significance statistics used in the logistic regression are different from those used in a linear regression.  $p$  can be calculated with the following formula:

$$p = \frac{e^{\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots}}{1 + e^{\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots}} \quad (3)$$

in which  $p$  is the probability that a case is in a particular category,  $e$  is the base of natural logarithms,  $\beta_0$  is the constant of the equation, and  $\beta_i$  are the coefficients of the predictor variables.

Finally, following Long (1997), we perform a marginal effect analysis in order to evaluate how the change in a response is related to the change in a covariate. Regarding binary independent variables, marginal effects are computed as the difference of the probability of success when the covariate equals one and zero otherwise, while holding all other variables constant at their means.

$$\text{Marginal Effect } X_k = \Pr(Y = 1 | \bar{X}, X_k = 1) - \Pr(Y = 1 | \bar{X}, X_k = 0) \quad (4)$$

in which  $X_k$  is the covariate variable;  $Y$  is the binary dependent variable;  $\Pr(Y = 1 | \bar{X}, X_k = 1)$  is the probability of success when the covariate equals one; and  $\Pr(Y = 1 | \bar{X}, X_k = 0)$  is the probability of success when the covariate equals zero. In other words, with binary independent variables, the marginal effects measure discrete change, that is, how do the predicted probabilities change as the binary independent variable changes from zero to one?



## 4. Empirical results

### 4.1. Preliminary analysis

This unique dataset provides rich demographic and socioeconomic information and invaluable insights for Greek university students' financial penetration, vulnerability, literacy, fragility and financial wellbeing. Table 1 (Panels A and B) provide summary statistics regarding the frequency and proportion of the respondents' demographic, parental information, socioeconomic and financial behavior characteristics that are tabulated across female and male students and for the entire sample. Our dataset consisted of 51% male respondents. The age distribution was about 75.4% of individuals between 18 and 22 years of age, 23% between 23 and 28, and about 1.5% was over 29 years old. The vast majority of the respondents (97.1%) were Greeks while only 2.9% had a different nationality. Of the participants, 69.5% had no or less than two years of working experience, 18.9% had two to four years of working experience, while only a 11.6% of total respondents had more than four years working experience. Their father's education level was almost smoothly distributed. Only 27% of the sample had a father with at least a BS degree, while the majority of them had a father with a lower or upper high school degree. As for their mother's education level, 35.8% answered that their mother had a BS, MS, or a PhD degree, while 46.6% answered that their mother had an upper or lower high school degree or a primary school degree. Of the respondents, 91% had a father with a job while 20.8% answered that their mother was unemployed.

The survey asked university students to report their parents' gross monthly income. In our sample, the monthly gross income categories are: €1,000–€1999 with a proportion of 40.2%, while 21.7% have a parental monthly income between €2000 and €2999, 20.7% have a parental monthly income under €1000, and only 17.4% have a parental monthly gross income over €3000. We also include a variable labeled 'Income change' if the individual responded 'Yes' to the question, 'Did you (your family) experience an unexpected significant reduction of your gross income during the Global Financial Crisis (%)'. The summary statistics show that a huge 98.5% of the participants reported they suffered a negative income shock during the global financial crisis. Specifically, about a 55.9% answered that they had lost about 20–50% of their monthly gross income, 31.1% answered that they had lost over a 50% of their monthly gross income while 61.4% answered that they had reduced their standard of living.

Next, we asked participants to report their concerns about their future and their future income in parallel with questions about their daily financial behavior (Table 1 Panel B). Specifically, 92.5% were concerned about their future while 48% were concerned about their future family income. When respondents were asked about their daily financial behavior, the majority reported that they held a bank account (80.4%) and that they manage their bank account on their own (80.7%). Furthermore, about 55.3% of the participants reported that they kept a record of their expenses and only 6.6% of the respondents had investment experience, while almost 5% of the respondents saved the same amount of euros each month.

Moreover, the survey asked university students to report on their confidence that they could come up with €300 if an unexpected need arose within the next month as well as their perceived financial well-being in the sense of one's attitude toward financial status. The summary statistics show that the majority of the participants (82%) responded that 'I'm sure that I could come up' or 'Maybe I could come up' with €300 if an unexpected need arose in the next month. Respondents reported that they 'Always' or 'Most of the times' could cover everyday expenses (54.8%), while they were 'Regularly' or 'Rarely' saving for the long term (75%).

Table 2 reports the descriptive statistics tabulated across financially literate students, financially illiterate students, and for the entire sample. We denote as 'Financially Literate' a student who answered five questions correctly. In Table 2 we use two alternative scenarios for the financial literacy variable. The first scenario indicates that 'Financial Literacy' is a binary variable that equals one if the student correctly answers four or more questions and zero otherwise. The second scenario denotes that 'Financial Literacy' is an ordinal variable equaling 0,1,2,3,4, or 5 to capture the proficiency of the respondent. The results show that Greek university students have average financial knowledge scores which are below the baseline of 50% in all scenarios. Table 2 also reports the summary statistics of the variables used in the regression analysis over the entire dataset. The results show

that the number of males is higher in the sample of financially literate students than in the sample of financially illiterate students. The number of students with highly educated parents is greater in the sample of financially literate students, while the number of university students who keep records of expenses is higher in the sample of financially literate students than in the sample of financially illiterate students. The difference in the means of the two samples is statistically significant for the variables mentioned above. This significance provides evidence that the demographics, parental, or financial behavior characteristics are associated with high levels of financial knowledge.

The Spearman (1904) non-parametric measures of rank correlations between the alternative scenarios of financial literacy and demographic and socioeconomic variables are reported in Table 3. The results show that Financial Literacy is correlated with Financial Fragility and Financial Well-being at the 5% statistical significance

**Table 1.** Respondents' characteristics.

Variables	Female Students		Male Students		Entire sample		
	Frequencies	%	Frequencies	%	Frequencies	%	
Panel A							
Demographics							
Gender	222	48.7	234	51.3	456	100	
Age	18–22	183	40.1	161	35.3	344	75.5
	23–28	34	7.5	71	15.6	105	23
	29+	5	1.1	2	0.4	7	1.5
Nationality	Greek	212	46.5	231	50.7	443	97.1
	Other	10	2.2	3	0.7	13	2.9
Work Experience in years	None	68	14.9	60	13.2	128	28.1
	< 2	85	18.6	104	22.8	189	41.4
	2–4	41	9	45	9.9	86	18.9
	4–6	11	2.4	15	3.3	26	5.7
	> 6	17	3.7	10	2.2	27	5.9
Parents' Information							
Father's Education							
	No education	0	0	2	0.4	2	0.4
	Primary School	19	4.2	14	3.1	33	7.3
	Lower High School	16	3.5	15	3.3	31	6.9
	Upper High School	54	11.9	71	15.7	125	27.7
	Post-secondary education	45	10	51	11.3	96	21.2
	BSc	69	15.3	54	11.9	123	27.2
	MSc/PhD	17	3.8	25	5.5	42	9.3
Mother's Education							
	No education	0	0	0	0	0	0
	Primary School	14	3.1	10	2.2	24	5.3
	Lower High School	20	4.4	12	2.6	32	7.1
	Upper High School	72	15.9	83	18.3	155	34.2
	Post-secondary education	37	8.2	43	9.5	80	17.7
	BSc	73	16.1	67	14.8	140	30.9
	MSc/PhD	6	1.3	16	3.5	22	4.9
Father's Unemployment							
	No	201	44.1	213	46.7	414	90.8
	Yes	21	4.6	21	4.6	42	9.2
Mother's Unemployment							
	No	175	38.4	186	40.8	361	79.2
	Yes	47	10.3	48	10.5	95	20.8
Monthly Income							
	< €1.000	54	13	32	7.7	86	20.7
	€1.001–€1.999	76	18.3	91	21.9	167	40.2
	€2.000–€2.999	35	8.4	55	13.3	90	21.7
	€3.000–€4.500	21	5.1	20	4.8	41	9.9
	> €4.500	17	4.1	14	3.4	31	7.5
Income Change							
	No change	2	0.4	5	1.1	7	1.5
	Under 20%	25	5.5	27	5.9	52	11.4
	20–50%	128	28.1	127	27.9	255	55.9
	Over 50%	67	14.7	75	16.4	142	31.1
Reduction of Standard of Living							
	No	90	19.7	86	18.9	176	38.6
	Yes	132	28.9	148	32.5	280	61.4

(continued).



**Table 1.** Continued.

Variables		Female Students		Male Students		Entire sample	
		Frequencies	%	Frequencies	%	Frequencies	%
Panel B							
Financial Behavior							
Keep expenses' record	No	96	21.1	108	23.7	204	44.7
	Yes	126	27.6	126	27.6	252	55.3
Hold of a Bank account	No	45	9.9	44	9.7	89	19.6
	Yes	177	38.9	189	41.5	366	80.4
Manage my account	No	40	8.8	48	10.5	88	19.3
	Yes	182	39.9	186	40.8	368	80.7
Saving	Each month same amount	13	2.9	9	2.0	22	4.8
	When I have enough money	14	3.1	22	4.8	36	7.9
	When I want to buy sth	26	5.7	29	6.4	55	12.1
	I don't save	130	28.5	129	28.3	259	56.8
Investment Experience	I don't have money to save	39	8.6	45	9.9	84	18.4
	No	210	46.1	216	47.4	426	93.4
	Yes	12	2.6	18	3.9	30	6.6
Financial Fragility							
How confident are you that you could come up with €300 if an unexpected need arose within the next month?	I'm sure that I couldn't come up	20	4.5	20	4.5	40	9.0
	Maybe I couldn't come up	18	4.0	22	4.9	40	9.0
	Maybe I could come up	96	21.6	82	18.4	178	40
	I'm sure that I could come up	84	18.9	103	23.1	187	42
Financial Well-being							
Cover everyday expenses	Never	62	13.6	58	12.7	120	26.3
	Almost never	41	9.0	45	9.9	86	18.9
	Most of the times	58	12.7	78	17.1	136	29.8
	Always	61	13.4	53	11.6	114	25
Long –Term Saving	No money to save	55	12.1	46	10.1	101	22.1
	Never	10	2.2	3	0.7	13	2.9
	Rarely	101	22.1	113	24.8	214	46.9
	Regularly	56	12.3	72	15.8	128	28.1
Future Concerns							
Concern about your future	No	9	2.0	25	5.5	34	7.5
	Yes	213	46.7	209	45.8	422	92.5
Concern about your future income	No	124	27.2	113	24.8	237	52
	Yes	98	21.5	121	26.5	219	48

Note: This table reports the summary statistics regarding the frequency and proportion of the respondent characteristics that are tabulated across female students, male students, and for the entire sample.

level. Also, the scenario in which a student is Financially Literate is correlated with the aforementioned variables at higher levels than the alternative scenarios of financial literacy. The correlations among financial literacy, financial fragility, and financial well-being variables with demographics, parental and financial behavior variables provide evidence that students' demographic characteristics and financial behaviors could influence their levels of financial literacy.

#### 4.2. Determinants of financial literacy

Our 'Financial Literacy' variable stems from five questions in the survey which are similar to those originally developed by Klapper, Lusardi, and van Oudheusden (2015). In order to define their levels of financial literacy, participants were asked to answer the following questions:

Q<sub>1</sub>: Suppose you need to borrow €100. Which is the lower amount to pay back: €105 or €100 plus three percent?  
 [€105; €100 plus three percent; don't know; refused to answer]

**Table 2.** Descriptive statistics – financially literate vs financially illiterate.

Variables	Entire Sample		Financial Literate		Financial Illiterate		Diff
	Mean	St. Dev	Mean	St. Dev	Mean	St. Dev	
<b>Financial Literacy</b>							
Scenario 1 (at least 4 correct answers)	0.49	0.501	1.00	0.000	0.38	0.486	-0.62**
Scenario 2 (continuous approach)	2.37	1.217	5.00	0.000	2.98	1.024	-2.01**
<b>Demographics</b>							
Gender	0.49	0.500	0.51	0.487	0.48	0.500	0.139**
Age	0.26	0.473	0.22	0.414	0.27	0.486	0.056
Nationality	0.03	0.167	0.01	0.107	0.03	0.178	0.021
Work Experience	1.2	1.092	1.07	0.980	1.23	1.116	0.163
<b>Parents' Information</b>							
Father's Education	3.81	1.375	3.91	1.271	3.78	1.399	-0.123*
Mother's Education	3.76	1.246	3.73	1.296	3.77	1.236	0.039
Father's Unemployment	0.09	0.289	0.07	0.254	0.10	0.297	0.030
Mother's Unemployment	0.208	0.409	0.216	0.413	0.207	0.405	-0.009
Monthly Income	1.8	1.606	1.70	1.151	1.82	1.629	0.116
Income Change	2.17	0.678	2.14	0.730	2.17	0.666	0.038
Reduction of Standard of Living	0.61	0.487	0.60	0.492	0.62	0.487	0.015
<b>Financial Behavior</b>							
Keep expenses' record	0.55	0.498	0.65	0.480	0.53	0.500	-0.11**
Hold of a Bank account	0.80	0.397	0.81	0.397	0.80	0.398	-0.003
Manage my account	0.81	0.395	0.77	0.421	0.82	0.389	0.042
Saving	2.76	1.000	2.82	0.941	2.75	1.014	-0.071
Investment Experience	0.07	0.248	0.06	0.233	0.07	0.252	0.011
<b>Future Concerns</b>							
Concern about your future	0.93	0.263	0.92	0.272	0.93	0.261	0.006
Concern about your future income	0.48	0.500	0.51	0.503	0.47	0.500	-0.039

Note: This table presents the statistics of the variables used in the regression analysis. The first two columns give the means and standard deviations (St.Dev.) of the variables for the entire sample. Next, it gives the means and standard deviations of the variables for the subsamples of financially literate (5 correct answers) and financially illiterate students. The first scenario indicates that 'Financial Literacy' is a binary variable that equals one if the student correctly answers four or more questions and zero otherwise. The second scenario denotes that 'Financial Literacy' is an ordinal variable that equals 0,1,2,3,4, or 5 to capture the proficiency of the respondent. Diff denotes the t-statistics for testing the difference of means between financially literate and financially illiterate students. The \*denotes a  $p$ -value  $< 0.1$ ; \*\*denotes a  $p$ -value  $< 0.05$ ; and \*\*\*denotes a  $p < 0.01$ .

**Table 3.** Correlation matrix for financial literacy variables.

	Gender	Age	Father's Education	Monthly Income	Keep record	Manage my account	Financial Literacy (5 correct)	Financial Literacy (> 4 correct)	Financial Literacy (continuous)	Financial Fragility
Age	-0.15**									
Father's Education	0.018	-0.003								
Monthly Income	-0.08*	-0.038	0.288**							
Keep record	0.029	0.054	0.018	-0.076*						
Manage my account	0.032	0.08*	-0.036	-0.099**	-0.108**					
Financial Literacy (5 correct)	-0.10**	-0.037	0.037	-0.018	0.094**	-0.042				
Financial Literacy (> 4 correct)	-0.13**	0.006	0.010	0.008	-0.009	-0.033	0.489**			
Financial Literacy (continuous)	-0.11**	-0.06	0.032	0.012	0.015	-0.050	0.705**	0.593**		
Financial Fragility	-0.057	0.045	0.073	0.091*	0.156**	0.074*	0.088*	0.057	0.071	
Financial Well-being	-0.014	0.049	-0.057	0.027	0.237**	0.198**	0.15**	0.13	0.014	0.524**

Note: This table presents the Spearman (1904) non-parametric measures of rank correlation for the most important variables. The \*indicates a  $p$ -value  $< 10\%$  and \*\*indicates a  $p$ -value  $< 5\%$ . Correlations for the rest of the database are available on request.

Q<sub>2</sub>: Suppose you put money in the bank for two years and the bank agrees to add 15 percent per year to your account. Will the bank add more money to your account the second year than it did the first year, or will it add the same amount of money both years?

[More; the same; don't know; refused to answer]

Q<sub>3</sub>: Suppose you had €100 in a savings account and the bank adds 10 percent per year to the account. How much money would you have in the account after five years if you did not remove any money from the account?

[**More than €150**; exactly €150; less than €150; don't know; refused to answer]

Q<sub>4</sub>: Suppose over the next 10 years the prices of the things you buy double. If your income also doubles, will you be able to buy less than you can buy today, the same as you can buy today, or more than you can buy today?

[Less; **the same**; more; don't know; refused to answer]

Q<sub>5</sub>: Suppose you have some money. Is it safer to put your money into one business or investment, or to put your money into multiple businesses or investments?

[One business or investment; **multiple businesses or investments**; don't know; refused to answer]

Table 4 presents the results of these questions. Results show that the level of financial literacy for Greek university students in absolute terms (students answered correctly all five financial knowledge questions) is 19.3%. For comparison reasons, if we apply the measurement level of financial literacy when participants have to answer at least four questions correctly, the level of financial literacy is 50%. Thus, the levels of financial literacy support the conjecture that university students in Greece have greater knowledge than the general population in Greece (45%), which is consistent with Klapper, Lusardi, and van Oudheusden (2015). Specifically, 81% and 77.4% of the respondents correctly answered the inflation question and the diversification question respectively, while the majority of the respondents correctly answered the questions on numeracy (interest) and the compound interest rate. Also, a higher percentage of male students had at least four correct responses as compared to female students. This result indicates that male students may be more financially knowledgeable. Overall, the results are in accordance with the studies in the literature review and are consistent with a similar study of Cypriot undergraduate students (Andreou and Philip 2018).

Proceeding with the cross-tabulation analysis, we use the 16 demographic, socioeconomic, and financial variables reported in Table 1 (Panels A and B) to investigate their effect on financial literacy. The results show that financial literacy is strongly dependent only on 'Gender', 'Father's Education', and 'Keep records of income/expenses' at the 5% significance level. The results show that in males, financial literacy is related to 'Gender', 'Father's Education', 'Father's Unemployment', 'Saving', and 'Keep records of income/expenses' at the 10% significance level, while for females, none of the examined variables are significantly related with financial literacy.<sup>2</sup>

Next, we perform a regression analysis to estimate models of the determinants of financial literacy. Table 5 (Panels A and B) present the results of the logistic regression and the ordinary least squares represent the determinants that influence students' levels of financial literacy. In general, the results show that among independent variables, 'Gender', 'Father's Education Level' and 'Keep record of expenses' are three determinants that are statistically significant. Furthermore, in terms of model criteria, the test results in Cox and Snell (1989), Nagelkerke (1991) and Hosmer and Lemeshow (1989) also show that the logistic regression model explains the variation in the dependent variable in a better way.

Further, the results in Table 5 (Panels A and B) show that students whose father has an upper high school degree, a BS degree, or a MS/PhD degree has 3.5 times, 3.1 times, or 2.2 times, respectively, higher possibility of being financially literate than those whose father has no education. The odds ratio for 'Gender' shows that male students are 2.02 times more likely to show acceptable levels of financial literacy than female students. Also, students who keep a record of expenses have a higher possibility of being financially literate than those who do not.

Next, we perform a marginal effects analysis in order to investigate how the probability of a student being financially literate changes as a determinant variable changes from zero to one while holding all other variables at their means. Figure 1 presents the marginal effects for the statistically significant factors from the logistic regressions and Table 7 presents their predicted probabilities. The results show that male students have a 0.115 greater predicted probability of being financially literate than female students, while students whose father has a BS degree or a MS/PhD degree have 0.162 and 0.106 greater predicted probabilities, respectively, of being financially literate than those whose father has no education. Also, students who keep a record of expenses have a 0.015 greater predicted probability of being financially literate than those who do not. Overall, the results of

**Table 4.** Responses to financial literacy questions.

	Female Students		Male Students		Entire sample	
	Frequencies	%	Frequencies	%	Frequencies	%
<i>Distribution of answers</i>						
Q <sub>1</sub> . Suppose you need to borrow €100. Which is the lower amount to pay back: €105 or €100 plus three percent?						
€105	60	13.2	52	11.4	112	24.6
<b>€100 plus three percent</b>	<b>11</b>	<b>24.3</b>	<b>147</b>	<b>32.2</b>	<b>258</b>	<b>56.6</b>
Don't know	51	11.2	35	7.7	86	18.9
Q <sub>2</sub> . Suppose you put money in the bank for 2 years and the bank agrees to add 15% per year to your account. Will the bank add more money to your account the second year than it did the first year, or will it add the same amount of money both years?						
<b>More</b>	<b>143</b>	<b>31.4</b>	<b>160</b>	<b>35.1</b>	<b>303</b>	<b>66.4</b>
The same	73	16.0	69	15.1	142	31.1
Don't know	6	1.3	5	1.1	11	2.4
Q <sub>3</sub> . Suppose you had €100 in a savings account and the bank adds 10% per year to the account. How much money would you have in the account after 5 years if you did not remove any money from the account?						
<b>More than €150</b>	<b>102</b>	<b>22.4</b>	<b>151</b>	<b>33.1</b>	<b>253</b>	<b>55.5</b>
Exactly €150 or Less than €150	112	24.6	80	17.5	192	42.1
Don't know	8	1.8	3	0.7	11	2.4
Q <sub>4</sub> . Suppose over the next 10 years the prices of the things you buy double. If your income also doubles, will you be able to buy less than you can buy today, the same as you can buy today, or more than you can buy today?						
Less or More	20	4.4	54	11.8	74	16.2
<b>The same</b>	<b>196</b>	<b>43</b>	<b>174</b>	<b>38.2</b>	<b>370</b>	<b>81.1</b>
Don't know	6	1.3	6	1.3	12	2.6
Q <sub>5</sub> . Suppose you have some money. Is it safer to put your money into one business or investment, or to put your money into multiple businesses or investments?						
One business or investment	38	8.3	34	7.5	72	15.8
<b>Multiple businesses or investments</b>	<b>170</b>	<b>37.3</b>	<b>183</b>	<b>40.1</b>	<b>353</b>	<b>77.4</b>
Don't know	14	3.1	17	3.7	31	6.8
<i>Distribution of correct answers</i>						
No correct answers	2	0.4	4	0.9	6	1.3
1 correct answer	15	3.3	16	3.5	31	6.8
2 correct answers	37	8.1	30	6.6	67	14.7
3 correct answers	72	15.8	52	11.4	124	27.2
4 correct answers	63	13.8	77	16.9	140	30.7
5 correct answers	33	7.2	55	12.1	88	19.3
Pearson Chi-Square			11.248**			
Spearman correlation			-0.115**			

Note: This table presents the patterns of responses to the five financial literacy questions that are tabulated across female students, male students, and the entire sample. The Pearson Chi-Squares indicate the values for Pearson (1900) statistic for a pairwise comparison between the number of correct answers and gender. The Spearman (1904) correlation denotes a nonparametric measure of rank correlation between the number of correct answers and gender. The \* indicates a  $p$ -value < 10%; \*\* indicates a  $p$ -value < 5%; and the \*\*\* indicates a  $p$ -value < 1%.

the marginal effects strengthen the results of the odds ratio by showing that those factors influence students' financial literacy levels at the 5% statistical significance level.

### 4.3. Financial fragility

We measure students' financial fragility with a similar question to that in Lusardi, Schneider, and Tufano (2011). However, we significantly reduced the amount of the unexpected shock  $w$  to be commensurate with students' allowance or income. Therefore, the students were asked whether they could cover an unexpected shock of €300 if it arose in the next month, Lusardi, Schneider, and Tufano (2011) uses \$2000. The cross-tabulation analysis shows that 42% claimed that they were sure that they could cover the amount, while 40% claimed that maybe they could cover the amount. Almost 60% of the participants were not that sure or they could not cover the amount of €300.<sup>3</sup>

Furthermore, we examine the relation between students' financial fragility and their 'absolute'/excellent financial literacy (e.g. answered correctly all five questions) along with a number of the other financial behavior variables. The Pearson's chi-square values show significant dependency between financial fragility and 'Work Experience', 'Keep record of expenses', and 'Hold a bank account' in the 1% statistical significance level while

the dependency between Financial Fragility and Financial Literacy was barely below the acceptable level of 10%. However, from the characteristics of the sample, 52.9% of the students with excellent financial literacy were certain that they could cover an unexpected economic shock. By contrast, only 35% of the students' with lower financial literacy answered that they could cover the unexpected amount. Recognizing this difference, we could assume that students with financial knowledge learned to manage their finances for rainy days.<sup>4</sup>

Next, we perform a logistic regression analysis to estimate the determinants of financial fragility. The regression uses explanatory variables which capture students' demographic characteristics and their financial behavior as well as their parents' background. Table 6 (Panels A and B) present the coefficients and odds ratios. In general, the results show that among the independent variables, 'Work Experience', 'Father's Education Level', 'Keep record of expenses', 'Saving', and 'Financial Literacy' are five factors that influence students' financial fragility at the 5% statistical significance level. Furthermore, in term of information criteria, the results for Cox and Snell (1989), Nagelkerke (1991) and Hosmer and Lemeshow (1989) show that the logistic regression model has a good fit with the data and explains 33% of the variation in the dependent variable.

Moreover, the results in Table 6 (Panels A and B) show that students whose father has a BS degree or a MS/PhD degree have a 1.2 times and a 2.01 times higher possibility, respectively, of not being financial fragile than those whose father has no education. The odds ratio for 'Work Experience' shows that students who have two to four years of work experience are 0.36 times more likely to show low levels of financial fragility than students with no proper work experience. Also, students who do not keep a record of expenses have a higher possibility of being financial fragile than those who do, while students who do not save money have a 1 times higher possibility of

**Table 5.** Determinants of financial literacy.

Variables	OLS Model		Logit Model 1		Logit Model 2	
		Coef	Coef	Odds Ratios	Coef	Odds Ratios
Panel A <sup>a</sup>						
Demographics						
Gender		2.367***	0.751***	2.472***	-0.832***	2.235***
Age	23–28	-0.328**	-0.232	0.793	-0.465	0.628
	29+	-1.815***	-0.950	0.142	-0.335	0.421
Nationality	Greek	0.236	0.664	1.942	-0.639	0.528
Work Experience in years	< 2	0.150	0.369	1.446	-0.138	0.871
	2–4	0.032	0.018	1.018	-0.144	0.728
	4–6	0.573**	0.010	1.747	-0.318	1.343
	> 6	0.447	0.914	2.495	0.295	0.469
Parents' Information						
Father's Education	Primary School	-1.394	0.558	1.345	0.011	0.965
	Lower High School	0.282	0.663	1.940	0.021	1.021
	Upper High School	0.737**	1.181*	3.257*	1.253*	3.502*
	Post-secondary education	0.299	0.830*	2.294*	-0.105	0.900
	BSc	0.486*	0.747*	2.111*	1.133*	3.106*
	MSc/PhD	0.484**	0.875**	2.398**	0.820**	2.271**
Mother's Education	Primary School	0.386	0.146	0.989	0.644	1.205
	Lower High School	0.023	-0.638	1.157	0.492	1.904
	Upper High School	-0.187	-0.766	0.529	-0.087	1.636
	Post-secondary education	-0.091	-0.343	0.465	-0.254	0.917
	BSc	-0.030	-0.400	0.710	-0.291	0.775
	MSc/PhD	-0.099	0.111	0.670	0.566	0.748
Father's Unemployment	Yes	-0.144	-0.389	0.678	-0.602	0.547
Mother's Unemployment	Yes	0.208	0.537	1.711	0.168	1.183
Monthly Income	€1.001 – €1.999	0.151	-0.075	0.928	-0.134	0.875
	€2.000 – €2.999	0.263	0.178	1.195	0.091	1.096
	€3.000 – €4.500	0.176	-0.371	0.690	-0.192	0.825
	> €4.500	0.608*	0.713	2.040	0.531	1.701
Income Change	Under 20%	-0.250	-0.156	0.855	-0.526	0.591
	20–50%	-0.221	-0.416	0.660	-0.628	0.533
	Over 50%	-0.241	-0.369	0.691	-0.610	0.543

(continued)

**Table 5.** Continued.

Variables	OLS Model		Logit Model 1		Logit Model 2	
	Coef		Coef	Odds Ratios	Coef	Odds Ratios
Panel B <sup>b</sup>						
Financial Behavior						
Keep expenses' record	Yes	−0.212	−0.402	0.669	1.107**	0.899**
Hold of a Bank account	Yes	−0.135		0.599	0.102	0.735
Manage my account	Yes	−0.255	−0.386	0.680	−0.469	0.626
Saving	When I have enough money	−0.167	−0.643	0.526	−0.156	0.855
	When I want to buy sth	−0.488	−0.468	0.230	−0.784	0.457
	I don't save	0.055	−0.345	0.708	0.342	1.408
	I don't have money to save	−0.173	−0.524	0.592	−0.146	0.864
Investment Experience	Yes	−0.175	−0.407	0.666	−0.063	0.939
Future Concerns						
Concern about your future income	Yes	0.011	−0.081	0.922	0.180	1.197
Constant		3.708***	1.542	4.673	−0.343	0.710
Models' Information						
−2Log Likelihood		650.21		555.01		360.9
Cox and Snell (1989)		0.104		0.122		0.159
Nagelkerke (1991)		0.109		0.163		0.24
Hosmer and Lemeshow (1989)		2.875		3.847		14.00**

<sup>a</sup>This table presents the results of the logistic regression and the ordinary least squares on the factors that influence students' financial literacy. The coefficients for the OLS model and the coefficients and odds ratios for the logit models are presented with their statistical validity. The dependent variable (Financial Literacy) in the OLS model denotes the respondents' correct answers in a continuous way. The dependent variable (Financial Literacy) in the logit model 1 equals one if the student correctly answers four or more questions and zero otherwise. The dependent variable (Financial Literacy) in logit model 2 equals one if the student correctly answers all questions and zero otherwise. The \*denotes a  $p$ -value < 0.1; \*\*denotes a  $p$ -value < 0.05; and the \*\*\*denotes a  $p$ -value < 0.01.

<sup>b</sup>This table presents the results for the logistic regression and the ordinary least squares on the factors that influence students' financial literacy. The coefficients for the OLS model and the coefficients and odds ratios for the logit models are presented with their statistical validity. The dependent variable in the OLS model denotes the respondents' correct answers in a continuous way. The dependent variable (Financial Literacy) in logit model 1 equals one if the student correctly answers four or more questions and zero otherwise. The dependent variable (Financial Literacy) in logit model 2 equals one if the student correctly answers all questions and zero otherwise. Cox and Snell (1989) and Nagelkerke (1991) measure the proportion of the variance that the model is able to explain. The Hosmer and Lemeshow (1989) test estimates the goodness of fit with the data. The \*denotes a  $p$ -value < 0.1; \*\*denotes a  $p$ -value < 0.05; and the \*\*\*denotes a  $p$ -value < 0.01.

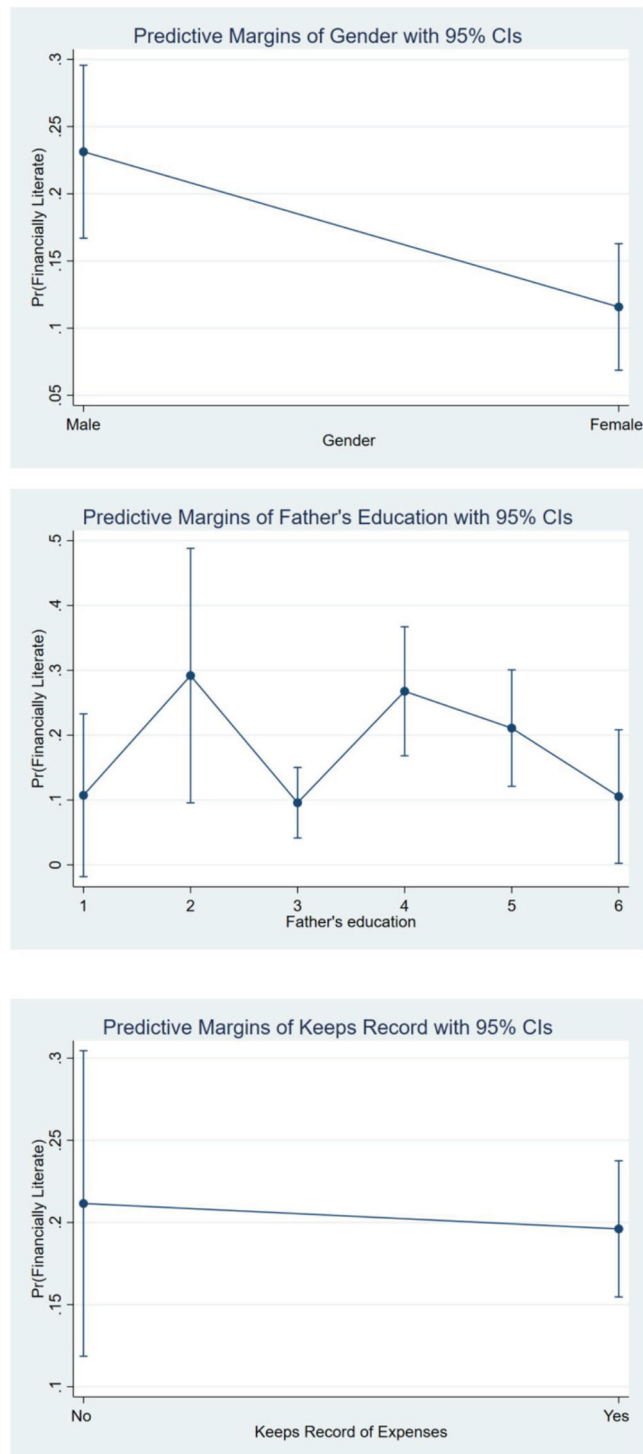
being financially fragile than those who save. The results also show that financially illiterate students have a 1.6 times higher possibility of being financially fragile than financially literate students.

Next, we perform a marginal effects analysis in order to investigate how the probability of a student being financially fragile changes as a determinant variable changes from zero to one, holding all other variables at their means. Figure 2 presents the marginal effects for the statistically significant factors from the logistic regressions that influence students' financial fragility while Table 7 presents the predicted probabilities. The results show that students whose father has a BS degree or a MS/PhD degree have 0.033 and 0.024, respectively, greater predicted probabilities of not being financially fragile than those whose father has no education. The predicted probabilities for 'Work Experience' show that students who have more than two years of work experience have over a 0.056 greater predicted probability of showing low levels of financial fragility than students with no proper work experience. Also, students who do not keep a record of expenses have a 0.118 greater predicted probability of being financial fragile than those who do. Furthermore, students who do not have money to save have a greater predicted probability of being financial fragile, while students' with high levels of financial literacy have a 0.152 greater predicted probability of not being financially fragile. Overall, the results of the marginal effects strengthen the results of the odds ratio by showing that the determinants influence students' financial fragility levels at the 5% statistical significance level.

#### 4.4. Financial well-being

Financial well-being is the ultimate outcome of financial literacy. The financial attitude of an individual also determines the level of financial well-being of the respondents. A positive and healthy financial attitude leads to





**Figure 1.** Financial literacy determinants' marginal effects.

Note: Figures present the plots of the predicted probabilities of someone being financially literate for the statistically significant factors in the logistic regressions that influence students' financial literacy, while holding all the other covariates at their mean. They also show the 95% confidence intervals for each predicted probability.

a higher level of financial well-being. We measure financial well-being with two questions adapted from Hira and Mugenda's (1999a, 1999b) measure of financial satisfaction: money saved and the current financial situation.

Q<sub>1</sub>: Could you cover everyday expenses?

Q<sub>2</sub>: Do you save for your future?

Therefore, we asked university students can you 'Cover everyday expenses?' and 'If they are saving for long term'. We define as 'High level of Financial Well-being' the students who respond that they can 'Most of the times' or 'Always' cover everyday expenses and 'Regularly' or 'Rarely' saves for the future.

The cross-tabulation analysis shows that over a half of the students could cover everyday expenses or could cover them most of the time, while only 26% answer that they could not cover these expenses. Furthermore, over a vast majority of the students, 71%, do not save or rarely save money for their future. These are interesting signs which show that the recent global and local financial crises have influenced the financial behavior of Greek university students.<sup>5</sup>

Next, we test the dependencies between Financial Literacy, Financial Fragility, Financial Well-being and demographic, parental, and financial behavior variables. The results show that financial well-being depends on 'Financial Literacy', 'Financial fragility' as well as on students' financial behavior variables. This finding means that Greek university students who have high levels of financial literacy and good financial behavior have a higher possibility of achieving the so-called 'future well-being' for themselves and their families.<sup>6</sup>

**Table 6.** Determinants of financial fragility and financial well-being.

Variables	Financial Fragility		Financial Well-being		
	Coeff	Odds Ratios	Coeff	Odds Ratios	
Panel A <sup>a</sup>					
Demographics					
Gender	-0.248	0.781	-0.004	0.996	
Age					
	23-28	-0.164	0.849	-0.251	0.778
	29+	0.650	1.916	0.927	2.528
Nationality	Greek	-1.134	0.322	1.160	3.189
Work Experience in years	< 2	-0.012	0.988	1.204***	3.334***
	2-4	-1.002*	0.367**	1.260***	3.527***
	4-6	-0.513	0.599	1.338*	3.811*
	> 6	0.040	1.041	2.296***	9.938***
Parents' Information					
Father's Education					
	Primary School		3.012		1.220
	Lower High School	1.103	3.314	1.105	4.626
	Upper High School	1.198	1.891	0.532	1.173
	Post-secondary education	0.637	0.649	0.160	0.839
	BSc	0.432*	1.265*	-0.175**	0.988**
	MSc/PhD	0.235*	2.010*	-0.012**	3.019**
Mother's Education					
	Primary School	0.102	0.128	-0.711	0.181
	Lower High School	-0.052	0.199	-0.621	0.537
	Upper High School	0.617	0.287	-0.782	0.458
	Post-secondary education	0.247	0.339	-0.726	0.484
	BSc	-0.082	0.277	-0.164	0.312
	MSc/PhD	-0.284	0.128	-0.626	0.995
Father's Unemployment	Yes	0.108	1.114	0.167	1.182
Mother's Unemployment	Yes	0.087	1.091	0.024	1.024
Monthly Income	€1.001 - €1.999	0.435	1.545	0.302	1.352
	€2.000 - €2.999	-0.565	0.569	0.447	1.564
	€3.000 - €4.500	0.042	1.043	0.340	1.404
	> €4.500	-2.183	0.113	0.151	1.163
Income Change	Under 20%	-0.836	0.434	-0.871	0.419
	20-50%	-0.234	0.792	-0.232	0.793
	Over 50%	-0.584	0.458	-0.358	0.699

(continued).

**Table 6.** Continued.

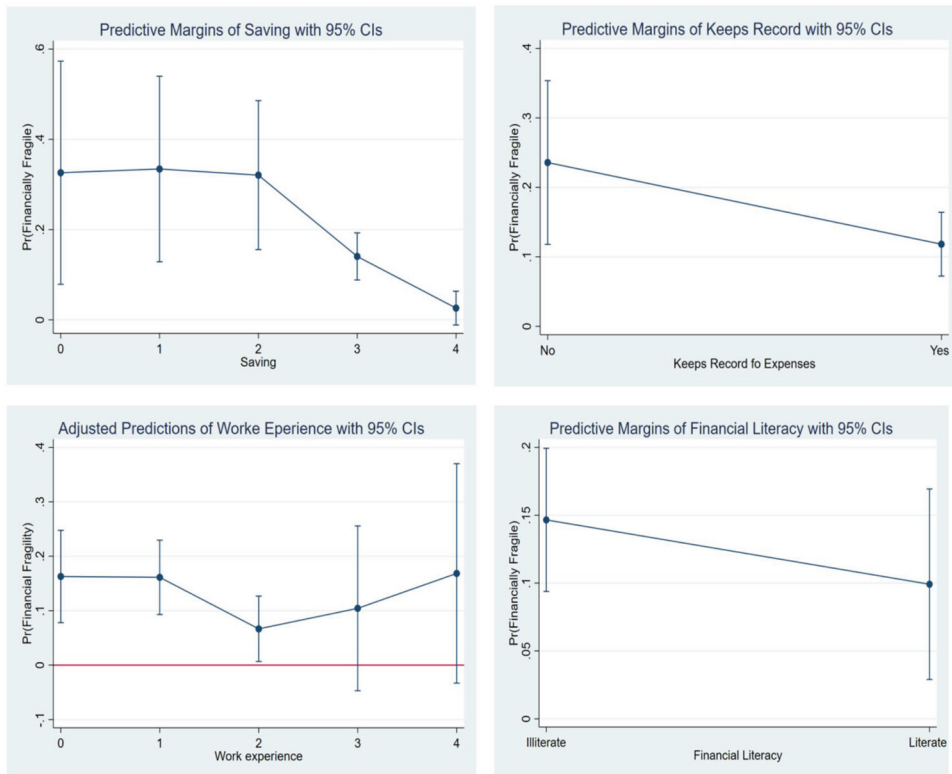
Variables	Financial Fragility		Financial Well-being		
	Coeff	Odds Ratios	Coeff	Odds Ratios	
Panel B <sup>b</sup>					
Financial Behavior					
Keep expenses' record	Yes	−0.833**	0.435**	0.305	1.356
Hold of a Bank account	Yes	0.267	0.733	0.099	0.599
Manage my account	Yes	−0.052	0.949	1.499***	4.478***
Saving	When I have enough money	2.896***	1.038***	4.856***	19.464***
	When I want to buy sth	1.224**	0.976**	2.928**	17.749**
	I don't save	−0.185	0.338	0.983	12.110
	I don't have money to save	−0.096	0.055	−0.179	0.895
Investment Experience	Yes	0.034	0.166	−0.120	0.887
Future Concerns					
Concern about your future income	Yes	−0.434	0.648	0.131	1.141
Financial Literacy	Literate	0.545	1.641**	0.798*	1.878*
Financial Fragility	Fragile			−4.483***	0.011***
Constant			6.860		0.009**
Models' Information					
−2Log Likelihood			1001.8***		1553.7***
Cox and Snell (1989)			0.296		0.652
Nagelkerke (1991)			0.328		0.658
Hosmer and Lemeshow (1989)			9.878**		13.110***

<sup>a</sup>Panel A presents the results of the logistic regression on the factors that influence students' financial fragility and financial well-being. The coefficients and odds ratios for the logit models are presented with their statistical validity. The dependent variable 'Financial Fragility' equals one if the student responds that 'I'm sure that I couldn't come up' or 'Maybe I couldn't come up' with €300 if an unexpected need arose in the next month and zero otherwise. The dependent variable 'Financial Well-being' equals one if the student responds that he or she can 'Most of the times' or 'Always' cover everyday expenses and 'Regularly' or 'Rarely' saves for the future and zero otherwise. The Financial Literacy variable equals one if the student correctly answers all questions and zero otherwise. The \*denotes a  $p$ -value < 0.1; \*\*denotes a  $p$ -value < 0.05; and the \*\*\*a denotes  $p$ -value < 0.01.

<sup>b</sup>Panel B presents the results of the logistic regression on the factors that influence students' financial fragility and financial well-being. The coefficients and odds ratios for the logit models are presented with their statistical validity. The dependent variable 'Financial Fragility' equals one if the student responds that 'I'm sure that I couldn't come up' or 'Maybe I couldn't come up' with €300 if an unexpected need arose in the next month and zero otherwise. The dependent variable 'Financial Well-being' equals one if the student responds that 'Most of the times' or 'Always' covers everyday expenses and 'Regularly' or 'Rarely' saves for the future and zero otherwise. Financial Literacy variable equals one if the student correctly answers all questions and zero otherwise. Cox and Snell (1989) and Nagelkerke (1991) measure the proportion of the variance that the model is able to explain. the Hosmer and Lemeshow (1989) test estimates the goodness of fit with the data. The \*denotes a  $p$ -value < 0.1; \*\*denotes a  $p$ -value < 0.05; and the \*\*\*denotes a  $p$ -value < 0.01.

To identify the factors that influence students' financial well-being, we perform a logistic regression analysis. Important variables that explain financial well-being are included in the regression as explanatory variables to capture students' demographic characteristics and financial behavior as well as their parents' background. Table 6 (Panels A and B) present the logistic regression's coefficients and odds ratios. In general, the results show that among the independent variables, 'Work Experience', 'Father's Education Level', 'Manage my bank account', 'Saving', 'Financial Literacy', and 'Financial Fragility' are the six factors that influence students' financial well-being at the 5% statistical significance level. Furthermore, in term of information criteria, the results for Cox and Snell (1989), Nagelkerke (1991) and Hosmer and Lemeshow (1989) show that the logistic regression model has a good fit with the data and explains 65% of the variation in the dependent variable.

Furthermore, the results in Table 6 (Panels A and B) show that students whose father has a BS degree or a MS/PhD degree have 1 and 3 times, respectively, higher possibilities of having higher levels of financial well-being than those whose father has no education. The odds ratio for 'Work Experience' shows that students who have two years of work experience are 3–9 times more likely to have high levels of financial well-being than students with no proper work experience. Also, students who manage their bank account on their own have a four times higher possibility of having higher levels of financial well-being than those who do not, while students who save money have a 17–19 times higher possibility of having higher levels of financial well-being than those who do not save. The results show that financially literate students have a 1.8 times higher possibility of having



**Figure 2.** Financial fragility determinants' marginal effects.

Note: Figures present the plots of the predicted probabilities of someone being financially fragile for the statistically significant factors in the logistic regressions that influence students' financial fragility, while holding all the other covariates at their mean. They also show the 95% confidence intervals for each predicted probability.

higher levels of financial well-being than financially illiterate students, while no financially fragile students have a better possibility of showing higher levels of financial well-being.

Next, we perform a marginal effects analysis to investigate how the probability of a student with a higher level of financial well-being changes as a determinant variable changes from zero to one, holding all other variables at their means. Figure 3 presents the marginal effects for the statistically significant factors from the logistic regressions. Table 7 presents the predicted probabilities for the statistically significant factors. The results show that students whose father has a MS/PhD degree have greater predicted probability of having higher levels of financial well-being than those whose father has no education. The predicted probabilities for 'Work Experience' show that students who have more than two years of work experience have over a 0.2 greater predicted probability of showing high levels of financial well-being than students with no proper work experience. Also, students who save money have a greater predicted probability of having higher levels of financial well-being while students' who manage their own account have 0.237 greater predicted probability of having higher levels of financial well-being. Finally, financially literate students have a 0.126 greater predicted probability of having higher levels of financial well-being than financially illiterate students while financial fragile students have a low predicted probability of having higher levels of financial well-being. Overall, the results of the marginal effects strengthen the results of the odds ratio by showing that the factors influence students' levels of financial well-being at the 5% statistical significance level.

## 5. Policy recommendations

Financial education in schools should be part of a coordinated holistic national strategy. The education system should be involved in the development of the strategy. As a young pupil can understand the importance of saving

**Table 7.** Marginal effects for the determinants of financial literacy, fragility and well-being.

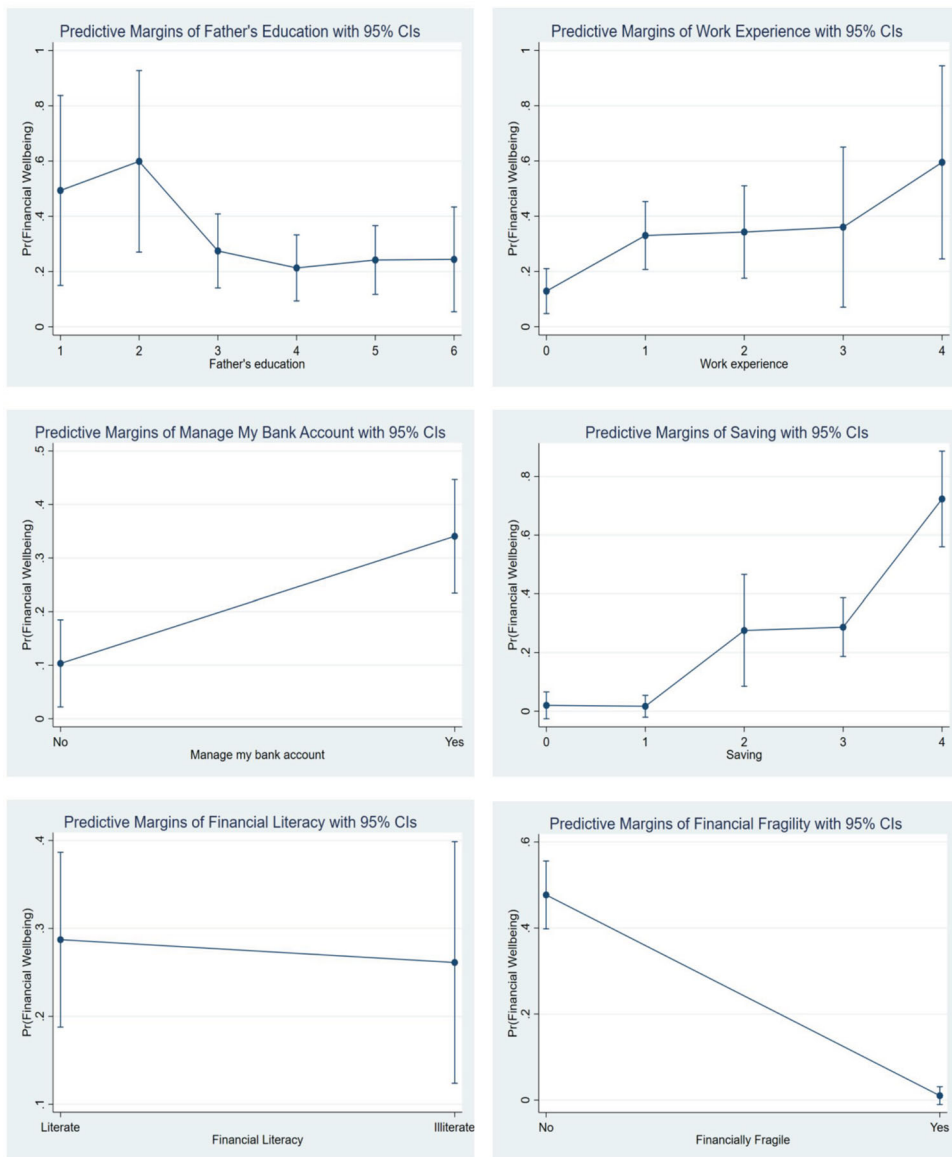
Variables		Financial Literacy	Financial Fragility	Financial Well-being
<b>Demographics</b>				
Gender		0.115***		
Work Experience in years	< 2		-0.002	0.201***
	2-4		0.096*	0.214**
	4-6		0.059*	0.232
	> 6		0.006**	0.466**
<b>Parents' Information</b>				
Father's Education	Primary School	0.050	0.210	0.115
	Lower High School	0.002	0.153	0.250
	Upper High School	0.187	0.172	0.355
	Post-secondary education	-0.010	0.075	0.031
	BSc	0.162**	0.033*	-0.031
	MSc/PhD	0.106**	0.024*	-0.002*
<b>Financial Behavior</b>				
Keep expenses' record	Yes	0.015*	0.118*	
	Saving			
Saving	When I have enough money		0.008**	0.003**
	When I want to buy sth		0.005	0.255***
	I don't save		0.185	0.267
	I don't have money to save		0.300	0.703
Manage my account	Yes			0.237***
Financial Literacy	Literate		0.152**	0.126*
Financial Fragility	Fragile			-0.908***

Note: Table 7 presents the marginal effects (dy/dx) for the statistically significant factors from the logistic regressions that influence students' financial literacy, financial fragility, and financial well-being at the 5% statistical significance level. The Financial Literacy variable equals one if the student correctly answers all questions and zero otherwise. The dependent variable 'Financial Fragility' equals one if the student respond that 'I'm sure that I couldn't come up' or 'Maybe I couldn't come up' with €300 if an unexpected need arose in the next month and zero otherwise. The dependent variable 'Financial Well-being' equals one if the student responds that he or she can 'Most of the times' or 'Always' cover everyday expenses and 'Regularly' or 'Rarely' saves for the future and zero otherwise. The \*denotes a  $p$ -value < 0.1; \*\*denotes a  $p$ -value < 0.05; and the \*\*\*denotes a  $p$ -value < 0.01. The marginal effects for the rest of the database are available on request.

money from the age of four, financial education should start as early as possible, ideally from the beginning of formal schooling and carry on until the end of the students' time at school. Financial education should ideally be a core part of the school curriculum. Unfortunately, the Greek public education system is based on a strict institutional framework, so financial education can be taught as an elective subject in the curriculum or integrated into other subjects like mathematics, economics, social science, citizenship, or history.

Greek authorities have not carried out any systematic and harmonized activities in schools or universities at the national level that focus solely on financial education unlike other European countries such as the Netherlands, Spain, Belgium, Croatia, and France. Further, the authorities scarcely imposed sanctions on creditors for inappropriate behavior and violations of the law. Basic financial principals were not covered while new technology trends in the financial sector such as Fintech, Insurtech, Digital Currencies, and Behavioral Finance are also excluded from the deliverable education in schools and universities. Knowledge of these subjects are crucial for individuals to meet the challenges in a currently dynamic global economic environment.

Therefore, we propose a holistic approach to financial education should consist of three pillars. The first pillar must deal with the lack of evidence about the levels of financial literacy and financial behavior in Greece. The collection of data can use national or international instruments such as the OECD/INFE survey for adults and the PISA financial literacy assessment for 15-year-old students. Both took place in 2015, and the PISA financial literacy assessment will be done again in 2018. We emphasize that for Greece, the OECD/INFE survey instrument does not clearly represent real financial and behavioral attitudes while the Greek results for the PISA assessment represent only general useful insights about mathematics and reading. Continuously measuring levels of financial literacy in Greece especially for specific groups such as immigrants, new parents, and elderly citizens as well as the construction of a national financial literacy index could be the first step in identifying the real financial behavior.



**Figure 3.** Financial well-being determinants' marginal effects.

Note: Figures present the plots of the predicted probabilities of someone achieving financial well-being for the statistically significant factors in the logistic regressions that influence students' financial fragility while holding all the other covariates at their mean. They also show the 95% confidence intervals for each predicted probability.

The second pillar refers to the adoption of a new financial education program that would mainly be implemented in primary and secondary schools. Financial education should start in primary school. Young students should be educated about financial matters as early as possible in their lives in order to form a new generation of financially educated citizens and a savings and effective investment culture as well as to build financial awareness.

The third pillar refers to actions which should be promoted to provide relevant, user-friendly financial information to the public, especially to the elderly, while free information services should be developed by formal policymakers in coordination with specialist organizations. Taking into account these principles we strongly



recommend the creation of a financial education website under the responsibility of the Ministry of Education or a university which would provide useful financial content.

These proposed actions would offer the basic financial knowledge necessary for every individual. They would contribute to the formulation of a new generation of financially educated citizens. Fighting financial ignorance and populism would help society to avoid incorrect consumer decisions and to easily understand the importance of the structural reforms needed. These poor decisions affect not only the people making them but also those who will undergo the consequences of these decisions as a side effect. Financially educated citizens benefit the economy as a whole by increasing competitiveness, innovation, and the quality of the financial products and services offered. Therefore, apart from the personal benefits, the financial education of all citizens is necessary for the smooth operation of the financial system and its stability. Under these conditions, the financial markets can operate effectively, and the economy can grow at sustainable rates.

## 6. Conclusions

The purpose of this study is to be the first among its kind. To do so, we measure the levels of financial literacy, financial fragility, and financial well-being to evaluate their influence among university students in Greece. These students reflect a generation that grew up in a unique financial crisis that rivaled the Great Depression of 1929. We also investigate the roles of demographic, socioeconomic and financial behavior characteristics on the change in financial literacy, financial fragility and financial well-being. Our study was inspired by previous works on measuring the levels of these variables; for example, Chen and Volpe (1998), Ergun (2018), Andreou and Philip (2018), and Gutter, Copur, and Garrison (2010) as well as on evaluating the relations among them; for example, Shim et al. (2009), Hogarth (2006) and Gutter, Copur, and Garrison (2010). Our findings are in accordance with very few studies in the literature, although Andreou and Philip (2018) and Sabri et al. (2010) are similar.

Our analysis produced the following results. First, the levels of financial literacy in Greek university students in absolute terms were 19.3%. Second, we analyze data using cross-tabulations, chi-square tests, logistic regressions, and marginal effect analyses. The results show that male students and students who keep a record of expenses or their father is highly educated are more financially literate. Third, we measure the levels of financial fragility, and we examine the relation between it and students' 'absolute' financial knowledge after adding control variables for demographics and socioeconomics. We show that financially literate students are better able to cope with an unexpected financial shock. Fourth, we investigate whether financial literacy is a key determinant of financial well-being. Hence, we perform a logit model and a marginal effect analysis to evaluate the relation between financial well-being, financial literacy, and financial fragility along with demographics and socioeconomic variables. The results show that financial literacy and low levels of financial fragility are key drivers of financial well-being among Greek university students. Further, we discuss the likely policy prescriptions that account for the related behavioral aspects and technological developments.

Our study is different from the empirical studies already conducted in three respects. First, to the best of our knowledge, none of these studies has estimated the levels of financial literacy, financial fragility and financial well-being in parallel with the identification of the demographic and socioeconomic factors that affect these three financial components. Second, this study is the first of its kind to evaluate the relation between financial literacy, financial fragility, and financial well-being among university students in Greece who are members of Generation Z. Third, we identify the lack of public policy actions on fighting financial literacy in Greece and propose a holistic approach for financial education.

A state should create the conditions for the well-being of its citizens. That well-being is strongly dependent on financial well-being. Therefore, the financial education of the entire population is necessary to address future challenges such as longevity, over-indebtedness, reduced quality of life, and future reductions in pensions. The proposed actions would contribute to the formulation of a new generation of financially educated citizens by offering the basic financial knowledge necessary for every individual. Apart from the personal benefits, financial education would improve the smooth operation of the financial system and its stability.

Similar to other research, the present study has some limitations. The small sample size is the primary limitation. The sample size can be increased by including students from different fields of studies. While the results from the survey act as a pilot study in understanding the financial literacy levels in Greece, they are limited to

drawing broader conclusions for the entire population. Therefore, a nationally representative household survey that is carried out as a policy step would allow a comprehensive assessment of the level of financial knowledge in Greece. The outcome of such a survey would enable policymakers and social planners to identify the priority areas and population segments in which to initiate programs for enhancing the financial capability of the country. Its results would also enable the country to benchmark its policy initiatives against other countries and coordinate its initiatives on the global front. An investigation of insurance and pension income literacy in Greece are also left for future research.

## Notes

1. According to Chen and Tsurumi (2010), logit and probit models differ in the assumption of the underlying distribution. Logit assumes the distribution is logistic (i.e., the outcome either happens or it does not). Probit models assume the underlying distribution is normal which means, essentially, that the observed outcome either happens or does not but this reflects a certain threshold being met for the underlying latent variable which is normally distributed. In practice the end result of these different distributional assumptions is that coefficients differ, usually by a factor of about 1.6. However, if we look at marginal effects (meaning the effects on the predicted mean of the outcome holding other covariates at the mean or averaging over observed values) the logit and probit models will make essentially the same predictions. So, if we are looking at marginal effects, the choice probably does not matter. On the other hand, if we are not going to go about calculating the margins, then the logit has the obvious advantage of generating coefficients that can be transformed into the familiar odds ratio by exponentiating the coefficient. Probit coefficients are essentially uninterpretable – given a probit model we would report average marginal effects for this very reason. The odds of an outcome occurring is a ratio of successes to failures (an odds of 1 would correspond to a probability of 0.5). Odds ratios, then, reflect the predicted change in the odds given a one unit change in the predictor. Thus, the odds ratio reflects change relative to the base odds of the outcome occurring. Given an outcome that either rarely occurs or almost always occurs, a small change in probability can correspond to a large odds ratio.
2. The cross-tabulation analysis and the Pearson (1900) Chi-Square's statistic for each pairwise comparison between financial literacy and demographic, parental, and socioeconomic variables are available on request.
3. Cross-tabulation analysis results are available on request.
4. Pearson (1900) Chi-Square's statistic for each pairwise comparison between financial literacy and demographics, parental, and socioeconomic variables are available on request.
5. Cross-tabulation analysis results are available on request.
6. Pearson (1900) Chi-Square's statistic for each pairwise comparison between financial literacy and demographics, parental, and socioeconomic variables are available on request.

## Disclosure statement

No potential conflict of interest was reported by the authors.

## References

- Alberdy, M. I., and B. Gharleghi. 2015. "Determinants of the Financial Literacy among College Students in Malaysia." *International Journal of Business Administration* 6 (3): 15–24.
- Andreou, P. C., and D. Philip. 2018. "Financial Knowledge among University Students and Implications for Personal Debt and Fraudulent Investments." *Cyprus Economic Policy Review* 12 (2): 3–23.
- Atkinson, A., and F. A. Messy. 2012. *Measuring Financial Literacy: Results of the OECD/International Network on Financial Education (INFE) Pilot Study*. OECD Working Papers on Finance, Insurance and Private Pensions 15, OECD.
- Beal, D. J., and S. B. Delpachitra. 2003. "Financial Literacy among Australian University Students." *Economic Papers: A Journal of Applied Economics and Policy* 22 (1): 65–78.
- Chan, S. F., A. W. Chau, and Y. K. Kim. 2012. "Financial Knowledge and Aptitudes: Impacts on College Students' Financial Well-Being." *College Student Journal* 46: 1.
- Chen, G., and H. Tsurumi. 2010. "Probit and Logit Model Selection." *Communications in Statistics—Theory and Methods* 40: 159–175.
- Chen, H., and R. P. Volpe. 1998. "An Analysis of Personal Financial Literacy among College Students." *Financial Services Review* 7 (2): 107–128.
- Cox, D. R., and E. J. Snell. 1989. *Analysis of Binary Data*. 2nd ed. London: Chapman and Hall/CRC.
- Ergun, K. 2018. "Financial Literacy among University Students: A Study in Eight European Countries." *International Journal of Consumer Studies* 42: 2–15.
- Falahati, L., and L. Paim. 2011. "Gender Differences in Financial Well-being among College Students." *Australian Journal of Basic and Applied Sciences* 5 (9): 1765–1776.

- Gutter, M. S., Z. Copur, and S. Garrison. 2010. *M.S. Financial Capabilities of College Students From States with Varying Financial Education Policies*. Denver, CO: National Endowment for Financial Education.
- Hira, T. K., and O. Mugenda. 1999a. "Do Men and Women Differ in Their Financial Beliefs and Behaviors?" In *Proceedings of Eastern Family Economics Resource Management Association, Eastern Family Economics Resource Management Association*, edited by K. Kitt, 1–8. Austin, TX.
- Hira, T. K., and O. Mugenda. 1999b. "The Relationships Between Self-worth and Financial Beliefs, Behavior, and Satisfaction." *Journal of Family and Consumer Sciences* 91 (4): 76–82.
- Hogarth, M. 2006. "Financial Education and Economic Development." International Conference hosted by the Russian G8 Presidency in Cooperation with the OECD.
- Hosmer, D., and S. Lemeshow. 1989. *Applied Logistic Regression*. New York: John Wiley & Sons.
- Joo, S., and J. E. Grable. 2004. "An Exploratory Framework of the Determinants of Financial Satisfaction." *Journal of Family and Economic Issues* 25 (1): 162–171.
- Klapper, L., A. Lusardi, and G. A. Panos. 2013. "Financial Literacy and Its Consequences: Evidence from Russia During the Financial Crisis." *Journal of Banking & Finance* 37: 3904–3923.
- Klapper, L., A. Lusardi, and P. van Oudheusden. 2015. *Financial Literacy Around the World: Insights from the Standard & Poor's Rating Services Global Financial Literacy Survey*.
- Klapper, L., and G. A. Panos. 2011. "Financial Literacy and Retirement Planning: The Russian Case." *Journal of Pension Economics and Finance* 10 (04): 599–618.
- Long, J. S. 1997. "Regression Models for Categorical and Limited Dependent Variables." *Advanced Quantitative Techniques in the Social Sciences Series*, Vol. 7.
- Lusardi, A., and O. S. Mitchell. 2006. *Financial Literacy and Planning: Implications for Retirement Well-being*. Working Paper, Pension Research Council, Wharton School, University of Pennsylvania.
- Lusardi, A., and O. S. Mitchell. 2011b. "Financial Literacy and Planning: Implications for Retirement Wellbeing." In *Financial Literacy: Implications for Retirement Security and the Financial Marketplace*, edited by A. Lusardi, and O. S. Mitchell, 17–39. Oxford: Oxford University Press.
- Lusardi, A., and O. S. Mitchell. 2014. "The Economic Importance of Financial Literacy: Theory and Evidence." *Journal of Economic Literature, American Economic Association* 52 (1): 5–44.
- Lusardi, A., D. J. Schneider, and P. Tufano. 2011. "Financially Fragile Households: Evidence and Implications." *Brookings Papers on Economic Activity*, pp. 83–150.
- Nagelkerke, N. D. 1991. "A Note on a General Definition of the Coefficient of Determination." *Biometrika* 78: 691–692.
- Oppong-Boakye, P. K., and R. Kansamba. 2013. "An Assessment of Financial Literacy Levels among Undergraduate Business Students in Ghana." *Research Journal of Finance and Accounting* 4 (8): 36–49.
- Pearson, K. 1900. "On the Criterion That a Given System of Deviations From the Probable in the Case of a Correlated System of Variables is Such That it Can Be Reasonably Supposed to Have Arisen from Random Sampling." *The London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science* 50 (302): 157–175.
- Sabri, F. M., M. MacDonald, T. K. Hira, and J. Masud. 2010. "Childhood Consumer Experience and the Financial Literacy of College Students in Malaysia." *Family and Consumer Sciences Research Journal* 38 (4): 455–467.
- Sarigül, H. 2014. "A Survey of Financial Literacy Among University Students." *Journal of Accounting & Finance* 64: 207–224.
- Shim, S., J. J. Xiao, B. L. Barber, and A. C. Lyons. 2009. "Pathways to Life Success: A Conceptual Model of Financial Well-being for Young Adults." *Journal of Applied Developmental Psychology* 30: 708–723.
- Spearman, C. 1904. "The Proof and Measurement of Association Between Two Things." *The American Journal of Psychology* 15: 72–101.
- Vitt, L. A., C. A. Anderson, J. Kent, and D. Lyter. 2000. *Personal Finance*. Washington, DC: Fannies Mea Foundation.
- Xiao, J. J., S. Shim, B. Barber, and A. Lyons. 2007. *Academic Success and Well-being of College Students: Financial Behaviours Matter*. Tucson, AZ: Take Charge American Institute for Consumer Financial Education and Research.