

What do consumers know and understand about effective interest rates? Evidence from a debt literacy survey in Poland

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Abstract

The key parameter in borrowing is the interest rate. However, research shows that many consumers have very low levels of debt literacy, including knowledge and understanding of effective interest rates. This article uses data obtained from a sample of 1,055 borrowers and a three-question debt literacy test to learn which properties of the effective interest rate notion and the calculation thereof are particularly difficult for consumers to comprehend. To this end, logistic regressions were applied which showed that, of the three aspects of the effective interest rate examined, the largest gaps in knowledge and understanding relate to the concept of the time value of money. Unlike the other two aspects, in this case knowledge gaps are more egalitarian – they affect women and men equally and they do not depend significantly on the level of education. Answers to the time value of money question are also differently related to non-cognitive factors compared to answers to the other two questions in the applied debt literacy test. Treating incorrect and “don’t know” responses as separate categories in multinomial regressions confirms these observations, but also suggests that each of these two response categories may convey different informational content.

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Key words

effective interest rate, annual percentage rate, annual percentage yield, financial literacy, debt literacy, financial education, Poland

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Introduction

Effective interest rate is a key parameter when taking loans. As opposed to the nominal interest rate, the effective rate includes all costs of a loan (not only its interest), com-

pounds the interest, and reflects the frequency as well as the time structure of payments. In many countries, financial institutions are required to report this parameter (albeit un-

der different names) in order to help consumers compare loan products and make an informed borrowing choice.¹ However, research shows that many consumers, including those who have experience with credit or loans, still have very little knowledge about terms of borrowing, including the effective interest burden, or they self-assess their credit inaccurately (Bucks and Pence, 2008; Courchane et al., 2008; Cwynar et al., 2017; Cwynar, 2020; Disney and Gathergood, 2013; Lusardi and Tufano, 2015; van Ooijen and van Rooij, 2016; Białowolski et al., 2021; Cwynar et al., 2016). This can result in poor borrowing decisions, compromising not only the financial well-being of households but also their financial security. Besides, pandemic of Covid-19 has changed behaviour of customers in many countries (Waliszewski and Warchlewska, 2021).

A great deal is already known about the correlates, predictors and consequences of low overall financial literacy and its subdomain-specific variants, including debt literacy – that is, consumers' knowledge and skills regarding borrowing and debt management. It has been shown that lower levels of tested financial and debt literacy are characteristic of women, the less educated, those with lower incomes, and ethnic minorities (Fernandes et al., 2014; Stolper and Walter, 2017). Low financial and debt literacy levels are also associated with low cognitive abilities in general (Gamble et al., 2015; Herd et al., 2012; James et al., 2012; Lusardi et al., 2010; O'Connor, 2019) and numeracy in particular (Almenberg and Widmark, 2012; Banks and Oldfield, 2007; Cole et al., 2011; Roa et al., 2019). It has been also documented that financial literacy is significantly related to downstream financial behaviours (Stolper

and Walter, 2017; Nguyen et al., 2019). Still, little is known about the relationship between financial literacy and non-cognitive, psychologically determined factors. Given that the overall apparatus of the effective interest rate consists of several compound mechanisms, it is unclear which of them pose the greatest challenge to consumers in terms of understanding, and how this relates to their socio-demographic and psychological profile. Such a diagnosis would help focus educational efforts on those areas where gaps in knowledge and understanding are greatest.

The aim of this article is to examine what consumers know and understand about the different sub-mechanisms that comprise the effective interest rate and how this knowledge and understanding is related to their sociodemographic and non-cognitive characteristics. In order to do this, we used the debt literacy test developed by Lusardi and Tufano (2015). We assumed that each question of this test diagnoses knowledge about a different mechanism that makes up the calculus and operation of the overall effective interest rate. The answers to these three questions were then used as the explained variables in logit models estimated separately for each question. Because recent financial literacy research suggests that “don't know” responses to test questions may bias financial literacy measurement results (Bucher-Koenen et al., 2017; Chen and Garand, 2018; Kim and Mountain, 2019; Ooi, 2020), we estimated three additional multinomial regression models with the same dependent and independent variables but with test question responses coded differently to capture the distinct informational content conveyed by incorrect responses and “don't know” responses.

Debt literacy has seldom been studied to date. Hence, any rigorous study – including the one presented in this article – can make an important contribution to knowledge on the subject. This article also contributes to the validation of the debt literacy

1 In this article it is assumed that, as opposed to the nominal interest rate, the effective interest rate factors in the compound interest and mimics an internal rate of return (IRR) calculus. We also abstract from terminological issues that would require a separate article, given the lack of uniform nomenclature and the resulting problems.

test used in the study. Given that the authors of the test (Lusardi and Tufano, 2015) do not report on its psychometric properties, and that this information has not been provided elsewhere, such validation through application to data from different surveys is of great value.

The unique contribution of this article is that, to the best of the authors' knowledge, it is the first to examine consumer knowledge and skills regarding the effective interest rate and the factors that may explain heterogeneity in the level of these knowledge and skills. The design of financial education programmes still requires precise information about what consumers' knowledge and skill deficits are. Focused research such as that presented in this article can be particularly valuable in concentrating financial education attention – in terms of both content and form – on specific aspects of effective interest rate knowledge and skills in which consumers have the greatest shortcomings.

1. Literature review

1.1 Financial literacy and borrowing outcomes

It is very well documented that financial literacy is low worldwide, though it also varies widely – both between and within countries. For instance, the most recent edition of the well-known OECD/INFE International Survey of Adult Financial Literacy (OECD, 2020) reports that across the entire sample the average financial literacy score reached 12.7 out of a maximum of 21 points, ranging from 11.1 (Italy) to 14.9 (Hong Kong, China). The most comprehensive financial literacy survey to date, the S&P Global FinLit Survey, which collects test responses from 148 countries, indicates that only one in three adult consumers are financially literate (i.e. they correctly answer at least three out of four questions asked) (Klapper et al., 2015).

Debt literacy studies are incomparably less numerous, but lead to the same conclusions: consumer knowledge of loans and credit and

the skills needed to make good borrowing decisions are low (Cwynar et al., 2019; Disney and Gathergood, 2013; Lusardi and Tufano, 2015; van Ooijen and van Rooij, 2016). Farias (2019) shows that because of the highly complex nature of information on personal loan pricing, even those customers of financial institutions who are more financially literate do not necessarily believe that they know more about personal loans' total costs, and that such belief is largely justified by the levels of actual knowledge. Courchane et al., (2008) provide evidence that some borrowers assess their credit inaccurately, while Bucks and Pence (2008) report that there are borrowers who have little knowledge of the terms and conditions under which their loans were granted. Van Ooijen and van Rooij (2016) show that in the same population, achieving high levels of debt literacy may be more difficult than achieving high levels of general financial literacy. A potential explanation of this effect is provided by the meta-analyses of Kaiser and Menkhoff (2017) and Miller et al., (2015), who show that financial education seems to be less effective when it comes to interventions related to credit and debt management issues. On the one hand, this may be due to the fact that decisions relating to some loans are non-recurring and do not allow for learning from experience (e.g. mortgages) (van Ooijen and van Rooij, 2016; Wagner and Walstad, 2019). On the other hand, Miller et al. (2015) argue that the reason for this may be that borrowing decisions depend on factors which consumers have limited influence over and, as a result, correcting behaviour is difficult. Research using the Financial Management Behaviour Scale developed by Dew and Xiao (2011) has shown that of the four domains of household financial management, it is borrowing behaviour that poses the most problems for consumers (Lind et al., 2020; Spuhler and Dew, 2019; Strömbäck et al., 2020; Veiga et al., 2019).

There is growing evidence that low financial literacy results in poorer credit and debt

management behaviour. Prior studies indicate that low levels of financial literacy foster borrowing at a high cost. Lusardi and Tufano (2015) in the US and Disney and Gathergood (2011) in the UK, studying a broad array of credit products (both secured and unsecured), show that lower levels of financial literacy are linked to the usage of higher cost credit. Particularly strong evidence comes from the market for alternative financial services (AFS). Several studies indicate that consumers with lower financial literacy are more likely to use high-cost AFS products such as payday loans, auto-title loans, rent-to-own transactions or pawn shops (Chatterjee, 2013; Disney and Gathergood, 2013; Lusardi and de Bassa Scheresberg, 2013; Robb et al., 2015). Examining rent-to-own transactions, Pak (2018) shows that the negative association between financial literacy and the tendency to borrow at a high cost is strengthened when the information available to the borrower is constrained. This may imply that consumers are “active thinkers” (Pak, 2018, 284) who indeed rely on their financial acumen when estimating the overall cost of borrowing.

Based on data from the Consumer Finance Monthly survey (1,851 households with mortgages) and an original financial literacy scoring grid allowing for the classification of respondents into three categories in terms of their financial literacy, Huston (2012) established that financially literate American consumers (i.e. those classified as being in the target financial literacy zone) were approximately twice as likely to pay lower interest on their mortgages than respondents classified as being in the danger zone. The results held true even after controlling for the forms of human capital other than financial literacy – such as education and experience. In a similar vein, Bialowolski et al., (2022), using data from the US Panel Study of Income Dynamics, show that more financially literate mortgage holders borrow at a lower interest rate and are more likely to refinance their mortgage loans.

Using data from two waves of the Italian Survey on Household Income and Wealth, Fornero et al., (2011) provide evidence that financial literacy increases the likelihood of comparison shopping before selecting a mortgage. There is also a strand of literature suggesting that more literate consumers have a better understanding of differences between distinct types of mortgages and are better able to select the type that is well-fitted to their specific situation, thus reducing mortgage costs. Gathergood and Weber (2017) and Smith et al., (2012) observe that financial literacy increases the likelihood of selecting an adjustable rate mortgage (ARM) compared to a fixed rate mortgage (FRM). Gathergood and Weber (2017) interpret this finding as being indicative of more financially literate consumers being more aware of the added cost entailed by the term premium of a fixed rate mortgage. Generally, such findings suggest that financially literate individuals may outperform the others in terms of their ability to scan and critically compare important features of various types of mortgage when making borrowing decisions. Fornero et al., (2011) show that financial literacy supports consumers’ ability to assess their risk exposure and match the type of mortgage (ARM or FRM) to the level of exposure.

Gathergood and Weber (2017) have established that less financially literate consumers tend to take out alternative mortgage products (AMPs) more often. The key feature of AMPs is a considerable reduction in upfront payments. For instance, interest-only mortgages – a popular form of AMP – require only the payment of interest during a set period. Used properly, AMPs can help to smooth the consumption of those borrowers who do not qualify for standard mortgage products (SMPs). However, AMPs may be mistakenly chosen by financially ignorant consumers as they do not fully understand the complexity of such products: Seay et al., (2017) provide a literature review showing that some borrowers who lack sufficient comprehension

of the properties of such products choose AMPs to the detriment of their households. Gathergood and Weber (2017) report that in their study a one-point increase in financial literacy score (on a four-point scale) translates into a decrease of around 50% in the likelihood of holding an AMP.

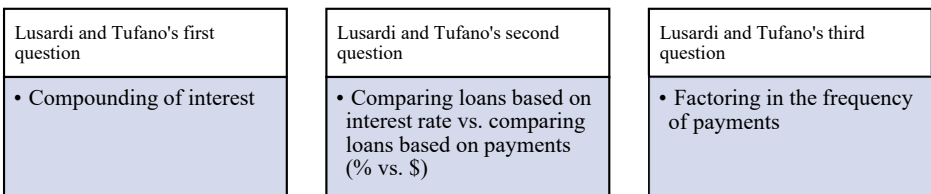
Finally, some studies provide evidence that shortcomings in financial literacy are positively related to the incidence of delays in repaying debt and delinquency that can contribute to the total cost burden entailed by the debt. Fornero et al., (2011) show that financial literacy decreases the likelihood of delays in mortgage debt repayments among Italian consumers. Using proprietary data from a large American subprime lender, Agarwal et al., (2017) report that mortgage borrowers working in the finance industry – deemed to be financially literate – are 14% less likely to default than borrowers not working in the industry. These results cannot be attributed to socioeconomic features, mortgage characteristics or other possibly relevant factors.

1.2 Measuring knowledge and understanding of the effective interest rate

The effective interest rate includes all costs of a loan (not only its interest), and reflects the frequency as well as the time structure of payments. Most importantly, the effective interest rate takes into account the effect of compounding interest, thus allowing comparisons between credit and loans with

different nominal interest rates, amounts, maturities, etc. In a nutshell, unlike other popular forms of interest burden, calculation of the effective interest rate requires application of the internal rate of return (IRR) logic. The three-question test developed by Lusardi and Tufano (2015) may be useful in examining how consumers deal with the effective interest rate. As they explain, their test focuses on three debt-related competencies: (i) understanding compound interest (the compound interest question), (ii) knowing how to pay off a credit card efficiently (the minimum payment question), and (iii) understanding the concept of the time value of money (the time value of money question). These three questions can be linked to three different mechanisms that make up the effective interest rate. First, the effective interest rate depends on the frequency of interest capitalisation (reflected in Lusardi and Tufano's first question). Second, the effective interest rate shows the cost of borrowing as a percentage while borrowers repay their debt as a currency amount (Lusardi and Tufano's second question). Third, the effective interest rate depends on how often payments (e.g. debt instalments) are made (Lusardi and Tufano's third question). This means that the test can be used as a battery of questions to find out whether respondents know the determinants of the effective interest rate, how these determinants affect the rate, and how the rate translates into payment volume (Figure 1).

Figure 1. Consecutive questions of Lusardi and Tufano's test (Lusardi and Tufano, 2015) and their relationship to properties of the effective interest rate



Source: own elaboration

Lusardi and Tufano's debt literacy test (Lusardi and Tufano, 2015) has so far been used in the United States (Lusardi and Tufano, 2015), the Netherlands (van Ooijen and van Rooij, 2016), and the United Kingdom (Disney and Gathergood, 2013), with one of the questions having different content in the latter country: the question on the time value of money has been replaced by a simple question on interest (Disney and Gathergood, 2013), resulting in a test that is noticeably simpler than Lusardi and Tufano's original version (Lusardi and Tufano, 2015). It was the question about the time value of money that proved the most difficult for respondents in both the US and the Netherlands. In contrast, the first question – about compound interest – proved to be the easiest (see Table 4). It was found in these studies that the following sociodemographic characteristics were significantly correlated with higher debt literacy scores: gender (being male is associated with higher scores) (Lusardi and Tufano, 2015; van Ooijen and van Rooij, 2016), level of education (Disney and Gathergood, 2013; van Ooijen and van Rooij, 2016), age (an inverted U-shaped pattern) (Lusardi and Tufano, 2015; van Ooijen and van Rooij, 2016), homeownership (Disney and Gathergood, 2013; van Ooijen and van Rooij, 2016), income (Disney and Gathergood, 2013; Lusardi and Tufano, 2015) and employment (Disney and Gathergood, 2013).

1.3 Financial literacy and non-cognitive factors

The survey that was the source of the data used in this study included a series of items designed to identify the psycho-social profile of the respondents (see the “Methods” section for details). They were a mix of questions diagnosing respondents' values, beliefs, attitudes, and behaviours primarily related to spending and consumption. The survey did not specify what construct(s) these items measured, labelling them only as “psycho-social variables.” For some items, identifying

the underlying constructs is straightforward. Item 10 (see Table 2) tested whether respondents did comparison shopping, which is deemed a desirable financial behaviour (Dew and Xiao, 2011). Likewise, items 11 and 12 were aimed at learning about financial behaviour – in this case, related to saving (i.e. the opposite of consumption). Item 13 measured trust in lending institutions (an attitudinal variable). Items 7–9 measured attitudes and behaviours related to risk. However, in the case of items 1–6, it is more difficult to pinpoint the underlying concepts precisely. They refer to values, beliefs, attitudes and behaviours that can be associated with such concepts as materialism, consumerism, (impulsive) spending, and, to a degree, spending self-control. The common denominator of all 13 items is that they are non-cognitive factors (variables) that proved to be useful in previous research in detecting undesirable financial behaviour and explaining deviations from what can be assumed rational (and desirable) financial behaviour (Agnew et al., 2012; Dew and Xiao, 2011; Gardarsdóttir and Dittmar, 2012; Gathergood, 2012; Lachance and Tang, 2012; Nye and Hillyard, 2013; Pangestu and Karnadi, 2020). Therefore, in this article, all these 13 items are analysed under the collective label of “non-cognitive factors.”

Although, as outlined above, much is known about how factors such as materialism, consumerism, risk propensity, self-control, and impulsive buying are related to financial behaviour, their relationship to financial literacy is considerably underresearched. Huhmann (2014) proposes a conceptual framework to link financial literacy with several non-cognitive factors, including materialism and self-control. Baker et al. (2019), in turn, report their findings on the relationship between financial literacy and behavioural biases such as the disposition effect, anchoring bias, and mental accounting, among others. Although some studies provide evidence that financial literacy reduces mate-

rialism and impulsive buying (Potrich and Vieira, 2018), that it can encourage risk-taking (Korkmaz et al., 2021), and increases the likelihood of trust in financial institutions (Van der Cuijzen et al., 2019), Altman (2012) argues that due to behavioural biases hardwired in consumers' brains – as suggested by the seminal works of behavioural economists (Kahneman, 2011; Thaler and Sunstein, 2009) – financial education and literacy may have limited influence on biased behaviour. However, the aim of this article is not to confirm or falsify the assumed relationship of financial literacy with selected non-cognitive variables. Rather, the aim is to examine whether non-cognitive variables can help understand why some aspects of the effective interest rate may be more difficult for consumers to understand than others. With access to psycho-social variables, we reasoned that examining their relationship to knowledge and understanding of the effective interest rate might shed new light on the difficulties of consumers in mastering the effective interest rate notion and calculus. In other words, the present study is exploratory in nature, and thus we do not make hypotheses regarding the association between the applied measure of debt literacy and non-cognitive factors.

To summarise, the key research questions arising from the existing literature and undertaken in this study are as follows:

1. What is the level of debt literacy among debtors in Poland?
2. What are their knowledge and skills regarding different aspects of the effective interest rate?
3. How do differences in this knowledge and these skills relate to both socio-demographic and non-cognitive factors?

2. Methods

2.1 Data collection

Between late May and early June 2017, Pollster Research Institute (hereinafter: Institute), a market research agency in Poland, conducted a survey entitled "Debt literacy of Polish credit market participants active on Facebook." Given that there is no sample frame of credit holders active on Facebook in Poland, a non-probabilistic (i.e. purposive) sample was used in the survey. Respondents (N=1,055) were contacted on a commercial online panel managed by the Institute, and they were surveyed using Computer-Assisted Web Interviewing (CAWI). Participation in the survey was limited to those who had personal experience with any formal loan no more than five years previously. The Institute matched the structure of respondents to the distribution of the main demographic variables characterising the Polish population (i.e. gender, age, place of residence, education). More details about the sample used in this study can be found in Table 1, where we compared the sample with a random sample of adult Poles.

Table 1. Composition of the sample used in this study

	Polish population*		Sample used in this study	
	%	N (million)	%	N
Gender				
Male	48	18.6	48	511
Female	52	19.8	52	544
Total	100	38.4	100	1,055
Place of residence				
Village	40	15.3	35	368
Town up to 20,000	13	5	9	98
Town 20,001–50,000	11	4.3	10	104
Town 50,001–100,000	8	3	11	114
City 100,001–200,000	8	3.2	8	88
City 200,001–500,000	20	7.6	11	114
City 500,001 or more				
Total	100	38.4	100	1,055
Level of education				
Primary	13	4.9	0.7	7
Junior high	5	1.5	0.7	7
Basic vocational	18	7	9	96
Secondary (uncompleted)	-	-	3	33
Secondary	28	10.7	28	292
Post-secondary	-	-	11	112
Bachelor's degree	-	-	7	76
Master's degree (uncompleted)	-	-	1	25
Master's degree	23	8.8	38	399
Ph.D. or higher degree	-	-	0.8	8
Total	86**	32.9**	100	1,055

Note: *Source: Statistics Poland (2018)

Source: own elaboration

2.2 Variables and measures

Debt literacy

We used the three-question multiple-choice test developed by Lusardi and Tufano (2015) as the measure of debt literacy. The following questions on this test were applied as

diagnostics of respondents' knowledge and understanding of various aspects of the effective interest rate: Q1 – the compound interest question (*Suppose you owe \$1,000 on your credit card and the interest rate you are charged is 20% per year compounded annually. If you didn't pay anything off, at*

this interest rate, how many years would it take for the amount you owe to double?) was used to gauge whether respondents understand the concept of interest compounding; Q2 – the minimum payment question (*You owe \$3,000 on your credit card. You pay a minimum payment of \$30 each month. At an Annual Percentage Rate of 12% (or 1% per month), how many years would it take to eliminate your credit card debt if you incurred no new additional charges?*) was used to gauge whether respondents understand the difference between loans cost expressed as interest rates vs. expressed as instalments (percentage vs. currency amount); Q3 – the time value of money question (*You purchase an appliance which costs \$1,000. To pay for this appliance, you are given the following two options: (a) pay 12 monthly instalments of \$100 each; (b) borrow at a 20% annual interest rate and pay back \$1,200 a year from now. Which is the more advantageous offer – in other words, which one will cost less?*) was used to gauge whether respondents understand how frequency and time structure of payments affect credit-related choices.

Given that there is a lively debate regarding the treatment of “don’t know” responses in knowledge tests in the relevant literature, we used two different approaches to coding responses to debt literacy test questions. First, building on arguments prevailing in the financial literacy literature, “don’t know” responses were treated as incorrect and coded as “0”, while each correct response was coded as “1”. Responses coded in this way were used in a series of logit models. This approach assumes that “don’t know” responses indicate a lack of knowledge or understanding. However, there is literature arguing that “don’t know” and incorrect responses to knowledge test questions may carry distinct informational load (for in-

stance, “don’t know” responses may indicate not only a complete lack of knowledge, but also partial knowledge, ambiguity of test items, low financial confidence on the part of respondents, or finally increased risk aversion (Bucher-Koenen et al., 2017; Chen and Garand, 2018; Lizotte and Sidman, 2009)). In other words, “don’t know” answers do not necessarily imply a lack of knowledge. In view of these considerations, we separately estimated multinomial regression models as a robustness check with correct responses coded as ‘1’, “don’t know” responses coded as ‘0’ and incorrect responses coded as ‘-1’ (see, for comparison, the approaches applied by Cwynar et al. (2019) and Henry et al. (2015)). In this way, we tested whether a different treatment of “don’t know” responses would confirm the results of the logit models.

Non-cognitive factors

Participants in the survey that provided us with the data were asked, among other things, to rate the extent to which they identified with 13 statements in the section labelled “Psycho-social variables.” Responses were given on a Likert scale from 1 (“definitely not”) to 5 (“definitely yes”). Because the questionnaire did not specify what characteristics (constructs) were measured by each single statement, we related them to variables known from the literature. Table 2 shows both the content of the statements and the constructs assigned to them. The constructs represent a broad cross-section of categories used in research at the intersection of economics and psychology, including consumer research. Because of this diversity and the apparent common denominator relating to the fact that they are all non-cognitive factors, in this paper we refer to them using the collective term “non-cognitive factors.”

Table 2. Non-cognitive factors used in this study

Item number	Statement	Related construct	Category	Range
11	I like to have money and buy what I like	Materialism	Values	1-5
12	I would feel better if I could afford more	Materialism	Values	1-5
13	It's worth paying more for branded clothes	Materialism	Values	1-5
14	I often replace things with newer things (e.g. phone, clothes)	Materialism	Values	1-5
15	I buy different things under the influence of ads or commercials	Impulsive buying	Behaviour	1-5
16	One should take advantage of promotional offers quickly while they're available	Impulsive buying	Beliefs/Attitude	1-5
17	Life without risk is boring	Risk taking	Beliefs/Attitude	1-5
18	I often exceed the speed limit	Risk taking	Behaviour	1-5
19	I visit dangerous places and countries	Risk taking	Behaviour	1-5
110	I check prices before I decide to buy	Comparison shopping	Behaviour	1-5
111	I have term deposit(s) with a bank or other financial institution	Saving	Behaviour	1-5
112	I put money aside for my retirement	Saving	Behaviour	1-5
113	I don't trust lending institutions	Trust	Attitude	1-5

Source: own elaboration

2.3 Models and analyses

The analyses were conducted in two steps. First, we estimated three logit models, each with the answer to one question from Lusardi and Tufano's test (Lusardi and Tufano, 2015) binary coded (correct=1, incorrect or "don't know"=0) as the dependent variable. Non-cognitive factors were used as the independent (ordinal) variables with a possible value range of 1 to 5 each, along with gender (dummy variable; female as a reference category), age (quantitative variable), level of education (ordinal variable; primary as a reference category), place of residence (ordinal variable; village as a reference category) and employment status (a set of dummy variables; not

having a given status was treated as a reference category) used as control variables. For each of Lusardi and Tufano's questions (Lusardi and Tufano, 2015), the logit models were estimated in two variants: (i) as a baseline model with sociodemographics only, and (ii) as a final model with both sociodemographics and non-cognitive factors (in this article we present the latter only). Logistic regression analysis was performed using the forward (conditional) stepwise method of selection.

Given that incorrect responses to the financial literacy test questions and "don't know" responses may carry a slightly different information load, we estimated three

consecutive multinomial regression models with the same variables as in the logit models but with the dependent variable coded differently (correct response=1, “Don’t know”=0, incorrect response=-1). Correct responses were treated as a reference in the multinomial regressions. This means that both incorrect answers and “don’t know” answers should be interpreted by reference to the correct answer (that is, an increase in the chance of an incorrect answer / a “don’t know” answer decreases the chance of a correct answer). In the next section, we report and interpret the results of all models – both logit and multinomial – in terms of odds ratios.

3. Results

3.1 Descriptive statistics

Table 3 shows the distribution of responses to the three questions of the debt literacy test used in the study. The percentage of respondents who answered correctly decreases with

each successive question – from 43% for the first question to only 7.5% for the third question. The same pattern has been observed in previous studies (Disney and Gathergood, 2012; Lusardi and Tufano, 2015; van Ooijen & van Rooij, 2016) (see Table 4). The percentage of respondents who answered “don’t know” to subsequent test questions in our study is very similar to that reported by Lusardi and Tufano (2015). It is noteworthy that compared to the other two questions, the percentage for the third question (the one about the time value of money) was very small. The same was noted by Lusardi and Tufano (2015) (in van Ooijen and van Rooij (2016), the percentage was only slightly smaller than for the other two questions). Such a low percentage of “don’t know” responses may indicate that respondents not only lack adequate knowledge and understanding of the concept of the time value of money, but do not even suspect that they may be wrong.

Table 3. Distribution of responses to questions of the debt literacy test used in the study

Q1 (the compound interest question)	Answer a: 2 years	Answer b: Fewer than 5 years (correct)	Answer c: 5 to 10 years	Answer d: More than 10 years	Answer e: I don't know
	199 (18.9%)	454 (43.0%)	186 (17.6%)	20 (1.9%)	196 (18.6%)
Q2 (the minimum payment question)	Answer a: Fewer than 5 years	Answer b: Between 5 and 10 years	Answer c: Between 10 and 15 years	Answer d: Never; you will continue to be in debt (correct)	Answer e: I don't know
	180 (17.1%)	287 (27.2%)	156 (14.8%)	222 (21.0%)	210 (19.9%)
Q3 (the time value of money question)	Answer a: Option (a)	Answer b: Option (b) (correct)	Answer c: They are the same	Answer d: I don't know	
	350 (33.2%)	79 (7.5%)	555 (52.6%)	71 (6.8%)	

Source: own elaboration

Table 5 shows how many respondents answered one, two, and three questions on the applied debt literacy test correctly, while

Table 6 shows the correlation between correct answers to each question of the test.

Table 4. Distribution of responses to the same debt literacy test obtained in this study vis-a-vis other studies

Researchers	Lusardi and Tufano	Van Ooijen and van Rooij	Disney and Gathergood	Our study
Country of origin of the sample	USA	Netherlands	UK	Poland
Sample size	1,000	1,464	Approximately 3,000	1,055
Sample characteristics and research technique	Weighted sample to make it representative of the US population with respect to key sociodemographic traits / Telephone survey	Sample representative for the Dutch population / Online (internet-based) survey	Sample representative for the UK population / Online (internet-based) survey	Purposive sample of borrowers / Online (internet-based) survey
Share of respondents who answered Q1 correctly (the compound interest question)	35.9%	66.8%	52.1%	43.0%
Share of respondents who answered Q2 correctly (the minimum payment question)	35.4%	48.3%	42.2%	21.0%
Share of respondents who answered Q3 correctly (the time value of money question)	6.9%	12.1%	Not included	7.5%
Share of respondents who answered all questions correctly	Not reported	9%	30%*	0.9%
Share of respondents who answered all questions incorrectly	Not reported	25%	11%*	47%

* Note that in Disney and Gathergood (2013), the time value of money question was replaced by a simple interest question. Consequently, the results reported here are not comparable to those obtained in the other three studies.

Source: own elaboration

Table 5. Number and percentage of respondents who answered one, two or three questions of the debt literacy test correctly

Number of questions answered correctly by the respondent	Number (% share of total sample)
0	496 (47.0)
1	372 (35.3)
2	178 (16.9)
3	9 (0.9)

Source: own elaboration

Table 6. Pearson correlation between correct answers to each question of the debt literacy test

	Q1	Q2	Q3
Q1	1	0.336**	0.147**
Q2		1	0.258**
Q3			1

** $p < 0.01$

Source: own elaboration

3.2 Logistic regressions – “Don’t know” responses included in the “incorrect” category

Table 7 shows the results of the logistic regression analyses with the responses to the first question of Lusardi and Tufano’s test as the dependent variable (the compound interest question (Lusardi and Tufano, 2015)). In the model, men are almost twice as likely to give the correct answer. The odds of answering correctly also increase by 13% with each successive level of education. Running a business almost doubles the chances of a correct response.

On the one hand, the respondents who identified more strongly with the statement “I like to have money and buy what I like” were more likely to answer correctly (moving to the next point of the Likert scale was associated with a 19% increase in the odds of answering correctly). On the other hand, those who identified more strongly with the statements “I buy different things under the influence of ads and commercials” and “Life without risk is boring” were less likely to respond correctly (a decrease in the chances of giving a correct answer by 13% and 12% respectively each time a higher value on the Likert scale was selected).

Table 7. Logit models with responses to the compound interest question as the dependent variable

	<i>B</i>	<i>SE</i>	<i>OR</i>	<i>95% CI for OR</i>	
				<i>LL</i>	<i>UL</i>
Gender	0.66***	0.14	1.93	1.47	2.53
Age	0.01	0.01	1.01	0.99	1.02
Level of education	0.13***	0.03	1.13	1.07	1.21
Place of residence	0.03	0.03	1.03	0.98	1.10
I have a steady job	0.14	0.19	1.15	0.79	1.68
I run a business	0.68*	0.27	1.98	1.16	3.39
I work odd jobs	0.32	0.29	1.38	0.78	2.42
I am unemployed	0.20	0.34	1.23	0.64	2.37
I am a student	0.08	0.35	1.09	0.54	2.17
I like to have money and buy what I like	0.17*	0.07	1.19	1.04	1.36
I would feel better if I could afford more	0.14	0.07	1.15	0.99	1.32
I buy different things under the influence of ads or commercials	-0.14*	0.06	0.87	0.77	0.98
Life without risk is boring	-0.13*	0.06	0.88	0.79	0.99
Constant	-2.60***	0.55	0.08		
Coxa and Snell $R^2 = 0.07$					

B – regression coefficient; *SE* – standard error; *OR* – odds ratio; *CI* – confidence interval; *LL* – lower limit; *UL* – upper limit

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Source: own elaboration

Table 8 reports the results of the logistic regression analyses with the responses to the second question of Lusardi and Tufano's test as the dependent variable (the minimum payment question (Lusardi and Tufano, 2015)). In the model, men are more than 2.5 times as likely to give the correct answer, while the odds of answering correctly also increase by 19% with each successive level of education. Those who reported being a stu-

dent were 2.8 times more likely to respond correctly to the second question in the test.

Of the non-cognitive factors examined, only one was found to be significant. Respondents' odds of answering correctly decreased by 30% each time they chose a value one point higher on the Likert scale in response to the statement "I visit dangerous places and countries."

Table 8. Logit models with responses to the minimum payment question as the dependent variable

	<i>B</i>	<i>SE</i>	<i>OR</i>	<i>95% CI for OR</i>	
				<i>LL</i>	<i>UL</i>
Gender	0.96***	0.18	2.62	1.85	3.71
Age	0.01	0.01	1.01	1.00	1.02
Level of education	0.18**	0.04	1.19	1.10	1.30
Place of residence	0.00	0.04	1.00	0.93	1.07
I have a steady job	0.28	0.24	1.33	0.83	2.12
I run a business	0.42	0.32	1.53	0.82	2.86
I work odd jobs	-0.01	0.38	0.99	0.47	2.08
I am unemployed	-1.23	0.76	0.29	0.07	1.31
I am a student	1.02*	0.40	2.78	1.27	6.06
I visit dangerous places and countries	-0.36**	0.08	0.70	0.60	0.82
Constant	-3.29***	0.55	0.04		
Cox and Snell R ² = 0.08					

B – regression coefficient; *SE* – standard error; *OR* – odds ratio; *CI* – confidence interval; *LL* – lower limit; *UL* – upper limit

p* < 0.05; *p* < 0.01; ****p* < 0.001

Source: own elaboration

Table 9 reports the results of the logistic regression analyses with the responses to the third question of Lusardi and Tufano’s test as the dependent variable (the time value of money question (Lusardi and Tufano, 2015)). The only sociodemographic trait significantly related to the dependent variable in the model is the place of residence: the odds of a correct response to this test question increase by 13% when the size of the place of residence increases by each successive level.

On the one hand, the lower the option on the Likert scale selected by respondents in response to the statements “I buy different

things under the influence of ads and commercials” and “I visit dangerous places and countries,” the more likely they were to give correct answers (the chance of correct answer increased by 29% and 33% respectively each time a higher value on the Likert scale was selected). On the other hand, the respondents who identified more strongly with the statement “I would feel better if I could afford more” were less likely to respond correctly (the chance of a correct answer decreased by 25% each time a higher value on the Likert scale was selected).

Table 9. Logit models with responses to the time value of money question as the dependent variable

	<i>B</i>	<i>SE</i>	<i>OR</i>	<i>95% CI for OR</i>	
				<i>LL</i>	<i>UL</i>
Gender	0.21	0.25	1.23	0.75	2.01
Age	0.01	0.01	1.01	0.99	1.03
Level of education	-0.04	0.06	0.96	0.86	1.08
Place of residence	0.12*	0.06	1.13	1.02	1.26
I have a steady job	-0.14	0.36	0.87	0.43	1.77
I run a business	-0.66	0.59	0.52	0.16	1.64
I work odd jobs	0.40	0.49	1.49	0.58	3.85
I am unemployed	-0.04	0.63	0.96	0.28	3.32
I am a student	-0.61	0.79	0.54	0.12	2.54
I would feel better if I could afford more	-0.29**	0.11	0.75	0.60	0.93
I buy different things under the influence of ads or commercials	0.26*	0.11	1.29	1.04	1.61
I visit dangerous places and countries	0.29**	0.10	1.33	1.10	1.62
Constant	-3.06**	0.92	0.05		
Coxa and Snell $R^2 = 0.03$					

B – regression coefficient; *SE* – standard error; *OR* – odds ratio; *CI* – confidence interval; *LL* – lower limit; *UP* – upper limit

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Source: own elaboration

3.3 Robustness check (multinomial regressions with incorrect and “don’t know” responses treated as separate categories)

Table 10 shows the results of the multinomial regression analyses with the responses to the first question of Lusardi and Tufano’s test as the dependent variable (the compound interest question (Lusardi and Tufano, 2015)) (Cox and Snell $R^2 = 0.13$). Women are 57% more likely to select an incorrect response and as much as 196% more likely to select the response “I don’t know”. The odds of selecting incorrect and “don’t know” responses are significantly lower for more educated individuals.

The odds of respondents giving an incorrect answer increased by 18% with each successive point on the Likert scale when asked to identify with the statements “I buy different things under the influence of ads and commercials” and “Life without risk is boring.” In contrast, these odds decreased for the respondents who identified more strongly with the statements “I like to have money and buy what I like” and “I would feel better if I could afford more.” The respondents who reported having term deposits were less likely to answer “I don’t know” on this question of the applied debt literacy test.

Table 10. Multinomial models with responses to the compound interest question as the dependent variable

		<i>B</i>	<i>SE</i>	<i>OR</i>	<i>95% CI for OR</i>	
					<i>LL</i>	<i>UL</i>
	Gender	0.45**	0.15	1.57	1.17	2.13
	Age	-0.01	0.01	0.99	0.98	1.00
	Level of education	-0.09*	0.04	0.92	0.86	0.99
	Place of residence	-0.06	0.03	0.94	0.88	1.00
	I like to have money and buy what I like	-0.19*	0.08	0.83	0.71	0.96
	I would feel better if I could afford more	-0.23**	0.08	0.79	0.67	0.93
	It's worth paying more for branded clothes	0.04	0.07	1.04	0.91	1.20
	I often replace things with newer ones (for example, phone, clothes)	-0.04	0.08	0.96	0.82	1.13
	I buy different things under the influence of ads or commercials	0.17*	0.08	1.18	1.02	1.37
	One should take advantage of promotional offers quickly while they're available	0.06	0.07	1.06	0.93	1.22
Incorrect responses	Life without risk is boring	0.17*	0.07	1.18	1.03	1.35
	I often exceed the speed limit	-0.03	0.06	0.97	0.86	1.10
	I visit dangerous places and countries	0.09	0.07	1.09	0.95	1.25
	I check prices before I decide to buy	0.07	0.08	1.07	0.92	1.25
	I have term deposit(s) with a bank or other financial institution	-0.04	0.05	0.96	0.87	1.07
	I put money aside for my retirement	0.00	0.06	1.00	0.89	1.13
	I do not trust lending institutions	0.00	0.07	1.00	0.88	1.13
	I have a steady job	-0.10	0.22	0.90	0.59	1.38
	I run a business	0.70*	0.32	2.01	1.08	3.75
	I work odd jobs	0.11	0.32	1.12	0.60	2.08
I am unemployed	-0.07	0.37	0.93	0.45	1.93	
I am a student	-0.18	0.38	0.84	0.40	1.75	
	Constant	0.72	1.00			

				95% CI for OR	
				LL	UL
	<i>B</i>	<i>SE</i>	<i>OR</i>		
Gender	1.09***	0.20	2.96	2.00	4.38
Age	0.00	0.01	1.00	0.99	1.02
Level of education	-0.19***	0.05	0.83	0.76	0.91
Place of residence	0.02	0.04	1.02	0.95	1.11
I like to have money and buy what I like	-0.14	0.09	0.87	0.73	1.05
I would feel better if I could afford more	0.01	0.11	1.01	0.82	1.24
It's worth paying more for branded clothes	0.08	0.09	1.08	0.91	1.28
I often replace things with newer ones (for example, phone, clothes)	-0.09	0.10	0.91	0.75	1.11
I buy different things under the influence of ads or commercials	0.11	0.09	1.11	0.93	1.33
One should take advantage of promotional offers quickly while they're available	0.03	0.09	1.03	0.87	1.21
"Don't know" responses	0.02	0.09	1.02	0.86	1.20
I often exceed the speed limit	-0.04	0.08	0.97	0.82	1.13
I visit dangerous places and countries	0.12	0.09	1.13	0.94	1.34
I check prices before I decide to buy	-0.02	0.10	0.98	0.81	1.19
I have term deposit(s) with a bank or other financial institution	-0.17*	0.07	0.84	0.73	0.97
I put money aside for my retirement	-0.12	0.08	0.89	0.76	1.04
I do not trust lending institutions	-0.06	0.08	0.95	0.81	1.11
I have a steady job	0.51*	0.26	1.66	1.00	2.74
I run a business	0.61	0.38	1.83	0.88	3.84
I work odd jobs	0.71	0.41	2.04	0.92	4.52
I am unemployed	0.66	0.44	1.93	0.82	4.53
I am a student	0.72	0.56	2.05	0.68	6.20
Constant	-2.03	1.30			

B – regression coefficient; *SE* – standard error; *OR* – odds ratio; *CI* – confidence interval; *LL* – lower limit; *UP* – upper limit

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Source: own elaboration

Table 11 shows the results of the multinomial regression analyses with the responses to the second question of Lusardi and Tufano's test as the dependent variable (the minimum payment question (Lusardi and Tufano, 2015)) (Cox and Snell $R^2 = 0.08$).

Women are 77% more likely to select an incorrect response and as much as 161% more likely to say "I don't know". The odds of selecting "I don't know" decrease by 15% with each successive level of education.

The higher the values on the Likert scale chosen in response to the statement “I visit dangerous places and countries,” the greater the chances that the respondent would give an incorrect answer to this question of the

applied debt literacy test. The respondents who reported that they put money aside for retirement were less likely to answer “I don’t know” to this question.

Table 11. Multinomial models with responses to the minimum payment question as the dependent variable

		<i>B</i>	<i>SE</i>	<i>OR</i>	<i>95% CI for OR</i>	
					<i>LL</i>	<i>UL</i>
	Gender	0.57**	0.17	1.77	1.26	2.49
	Age	-0.01	0.01	0.99	0.98	1.01
	Level of education	-0.08	0.04	0.92	0.85	1.00
	Place of residence	0.00	0.04	1.00	0.93	1.07
	I like to have money and buy what I like	-0.14	0.09	0.87	0.73	1.03
	I would feel better if I could afford more	0.15	0.09	1.16	0.97	1.39
	It’s worth paying more for branded clothes	0.10	0.08	1.10	0.94	1.29
	I often replace things with newer ones (for example, phone, clothes)	0.03	0.09	1.03	0.86	1.23
	I buy different things under the influence of ads or commercials	0.03	0.09	1.03	0.87	1.22
	One should take advantage of promotional offers quickly while they’re available	0.13	0.08	1.14	0.98	1.33
Incorrect responses	Life without risk is boring	-0.05	0.08	0.95	0.81	1.10
	I often exceed the speed limit	-0.04	0.07	0.96	0.84	1.11
	I visit dangerous places and countries	0.20*	0.08	1.22	1.04	1.43
	I check prices before I decide to buy	-0.17	0.09	0.85	0.71	1.02
	I have term deposit(s) with a bank or other financial institution	0.02	0.06	1.02	0.91	1.15
	I put money aside for my retirement	-0.06	0.07	0.94	0.82	1.08
	I do not trust lending institutions	0.00	0.07	1.00	0.86	1.15
	I have a steady job	0.09	0.24	1.09	0.69	1.73
	I run a business	0.16	0.33	1.17	0.62	2.21
	I work odd jobs	-0.14	0.37	0.87	0.42	1.80
	I am unemployed	-0.12	0.46	0.88	0.36	2.18
	I am a student	0.76	0.40	2.13	0.96	4.70
	Constant	0.77	1.11			

	<i>B</i>	<i>SE</i>	<i>OR</i>	<i>95% CI for OR</i>		
				<i>LL</i>	<i>UL</i>	
Gender	0.96***	0.22	2.61	1.70	4.02	
Age	-0.01	0.01	0.99	0.97	1.01	
Level of education	-0.17*	0.05	0.85	0.77	0.93	
Place of residence	0.03	0.05	1.03	0.94	1.12	
I like to have money and buy what I like	-0.08	0.11	0.92	0.75	1.13	
I would feel better if I could afford more	0.17	0.11	1.18	0.94	1.48	
It's worth paying more for branded clothes	0.08	0.10	1.08	0.89	1.31	
I often replace things with newer ones (for example, phone, clothes)	-0.13	0.11	0.88	0.71	1.10	
I buy different things under the influence of ads or commercials	0.13	0.11	1.14	0.93	1.40	
One should take advantage of promotional offers quickly while they're available	0.01	0.10	1.01	0.84	1.22	
"Don't know" responses	Life without risk is boring	-0.01	0.10	0.99	0.82	1.20
	I often exceed the speed limit	-0.15	0.09	0.86	0.72	1.03
	I visit dangerous places and countries	0.20	0.10	1.22	1.00	1.50
	I check prices before I decide to buy	-0.12	0.11	0.88	0.71	1.10
	I have term deposit(s) with a bank or other financial institution	0.01	0.08	1.01	0.87	1.17
	I put money aside for my retirement	-0.19*	0.09	0.82	0.69	0.98
	I do not trust lending institutions	-0.07	0.09	0.93	0.78	1.11
	I have a steady job	0.38	0.29	1.46	0.83	2.58
	I run a business	0.20	0.41	1.22	0.55	2.74
	I work odd jobs	0.05	0.45	1.05	0.44	2.52
I am unemployed	-0.03	0.52	0.97	0.35	2.69	
I am a student	0.88	0.52	2.40	0.87	6.63	
Constant	0.48	1.37				

B – regression coefficient; *SE* – standard error; *OR* – odds ratio; *CI* – confidence interval; *LL* – lower limit; *UP* – upper limit

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Source: own elaboration

Table 12 shows the results of the multinomial regression analyses with the responses to the third question of Lusardi and Tufano's test as the dependent variable (the time value of money question (Lusardi and Tufano, 2015)) (Cox and Snell $R^2 = 0.09$). Living in a larger town reduces the chances of answer-

ing this question incorrectly by 15% with each successive size category of the place of residence. No other sociodemographic trait turned out to be significant in the multinomial model with responses to the time value of money question as the dependent variable.

The odds of giving an incorrect answer decreased for the respondents who identified themselves more strongly with the statements “I buy different things under the influence of ads and commercials” and “I visit dangerous places and countries.” On the other hand, the odds increased if the respondent identified

themselves more strongly with the statement “I would feel better if I could afford more.” None of the variables are significantly associated with “don’t know” responses. This is true for both sociodemographic and non-cognitive variables.

Table 12. Multinomial models with responses to the time value of money question as the dependent variable

		<i>B</i>	<i>SE</i>	<i>OR</i>	<i>95% CI for OR</i>	
					<i>LL</i>	<i>UL</i>
	Gender	0.18	0.26	1.20	0.72	2.00
	Age	-0.01	0.01	0.99	0.97	1.01
	Level of education	0.05	0.06	1.05	0.94	1.18
	Place of residence	-0.13*	0.06	0.88	0.79	0.98
	I like to have money and buy what I like	-0.05	0.14	0.95	0.72	1.25
	I would feel better if I could afford more	0.33*	0.13	1.39	1.08	1.79
	It’s worth paying more for branded clothes	0.11	0.13	1.11	0.86	1.44
	I often replace things with newer ones (for example, phone, clothes)	0.12	0.14	1.13	0.85	1.49
	I buy different things under the influence of ads or commercials	-0.26*	0.13	0.77	0.60	0.98
	One should take advantage of promotional offers quickly while they’re available	-0.10	0.13	0.91	0.71	1.17
Incorrect responses	Life without risk is boring	0.00	0.13	1.00	0.78	1.28
	I often exceed the speed limit	-0.07	0.11	0.93	0.75	1.16
	I visit dangerous places and countries	-0.27*	0.11	0.77	0.62	0.95
	I check prices before I decide to buy	0.11	0.13	1.11	0.86	1.45
	I have term deposit(s) with a bank or other financial institution	-0.05	0.10	0.95	0.79	1.14
	I put money aside for my retirement	-0.07	0.11	0.93	0.75	1.15
	I do not trust lending institutions	0.05	0.12	1.05	0.84	1.32
	I have a steady job	-0.14	0.37	0.87	0.42	1.80
	I run a business	-0.65	0.60	0.52	0.16	1.68
	I work odd jobs	0.36	0.49	1.44	0.55	3.79
I am unemployed	-0.12	0.64	0.89	0.25	3.13	
I am a student	-0.69	0.80	0.50	0.10	2.40	
	Constant	3.59*	1.75			

	<i>B</i>	<i>SE</i>	<i>OR</i>	<i>95% CI for OR</i>		
				<i>LL</i>	<i>UL</i>	
Gender	0.63	0.37	1.88	0.92	3.86	
Age	0.00	0.02	1.00	0.97	1.04	
Level of education	-0.05	0.08	0.95	0.81	1.12	
Place of residence	-0.03	0.08	0.97	0.84	1.13	
I like to have money and buy what I like	-0.34	0.19	0.71	0.50	1.02	
I would feel better if I could afford more	0.03	0.17	1.03	0.73	1.44	
It's worth paying more for branded clothes	0.01	0.17	1.01	0.72	1.42	
I often replace things with newer ones (for example, phone, clothes)	-0.17	0.20	0.85	0.57	1.25	
I buy different things under the influence of ads or commercials	-0.10	0.18	0.91	0.64	1.28	
One should take advantage of promotional offers quickly while they're available	-0.05	0.18	0.96	0.68	1.35	
"Don't know" responses	Life without risk is boring	0.05	0.17	1.05	0.75	1.48
	I often exceed the speed limit	0.07	0.16	1.08	0.79	1.46
	I visit dangerous places and countries	-0.17	0.17	0.84	0.61	1.17
	I check prices before I decide to buy	-0.03	0.18	0.97	0.69	1.38
	I have term deposit(s) with a bank or other financial institution	-0.09	0.14	0.92	0.70	1.20
	I put money aside for my retirement	-0.25	0.16	0.78	0.57	1.06
	I do not trust lending institutions	-0.20	0.16	0.82	0.60	1.12
	I have a steady job	-0.54	0.52	0.59	0.21	1.63
	I run a business	-1.03	0.77	0.36	0.08	1.63
	I work odd jobs	0.45	0.76	1.56	0.35	7.00
	I am unemployed	0.71	1.01	2.03	0.28	14.72
	I am a student	0.12	1.30	1.13	0.09	14.44
Constant	3.49	2.54				

B – regression coefficient; *SE* – standard error; *OR* – odds ratio; *CI* – confidence interval; *LL* – lower limit; *UP* – upper limit

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Source: own elaboration

4. Discussion, implications and future research

Skilful use of the effective interest rate requires an understanding of the underlying mechanisms. In this paper, we identify three such sub-mechanisms and use three questions designed by Lusardi and Tufano (2015)

to investigate whether borrowers in Poland know and understand these mechanisms. The results indicate that debt literacy is low in Poland: as many as 47% of respondents did not give a single correct answer, and less than one percent answered all three questions correctly. Thus, the conclusions of our study are consistent with those reported by

Lusardi and Tufano (2015) based on evidence from the US, and by van Ooijen and van Rooij (2016) based on Dutch data, indicating a low level of debt literacy among consumers. As with both of these studies, in our study the first question (on compound interest) was most frequently answered correctly, while the third question (on the time value of money) was most frequently answered incorrectly. This means that while most consumers know and understand the concept of compound interest, only a few are able to apply the idea of the time value of money to a simple numerical task involving the comparison of two repayment schedules (the problem of frequency and time structure of payments). Such a result confirms anecdotal evidence familiar from both classrooms and the experience of financial institution employees with consumers. It should be borne in mind, however, that our results were obtained in a sample of borrowers – that is, people who were able to increase their financial literacy about credit and loans by learning through experience. It is likely that the debt literacy in the population as a whole is even slightly lower.

Our results clearly show that the third question in the applied debt literacy test, namely the one on the time value of money, is essentially different from the other two. Not only is it much more difficult, but it is also differently related to both sociodemographic variables and non-cognitive factors than the other two questions. First, the answers to the first and second questions on the test (the compound interest question and the minimum payment question, respectively) are significantly related to gender and level of education. For these two questions, the odds of answering correctly significantly increased, and the odds of answering incorrectly as well as selecting the answer “I don’t know” significantly decreased, for males and for respondents with higher levels of education. These relationships are well-known from previous literature on both overall financial literacy

and debt literacy: certain sociodemographic characteristics – including gender and level of education – promote better performance on financial literacy tests (Cupák et al., 2018; Kadoya and Khan, 2019; Lusardi and Mitchell, 2014; Nicolini et al., 2013; Santini et al., 2019). However, neither gender nor education level affected the odds of answering correctly (as well as the odds of answering incorrectly and choosing the answer “I don’t know”) to the third test question – the one about the time value of money. Interestingly, the odds of answering correctly increased (logit Models 5 and 6) and the odds of answering incorrectly decreased (multinomial Model 11) as the size of the place of residence increased – a result that is difficult to interpret clearly.

Such results shed interesting light on the phenomenon of the gender gap in financial literacy known from the literature (Al-Bahrani et al., 2020; Bucher-Koenen et al., 2017; Chen and Garand, 2018; Cupák et al., 2018; Fonseca et al., 2012; Hsu, 2016; Ooi, 2020). First, gender ceases to be a differentiating factor in responses to the most difficult question of the applied debt literacy test. A similar effect was observed in Lusardi and Tufano’s study (Lusardi and Tufano, 2015). Second, multinomial models provide a better understanding of how gender differentiates responses to the two simpler questions on the test. In multinomial models, women are significantly more likely to give incorrect answers, but the significant difference between men and women can be noted in the likelihood of choosing the answer “I don’t know”. These results confirm what has been previously observed (Bucher-Koenen et al., 2017; Z. Chen and Garand, 2018; Ooi, 2020) – the gender gap in financial literacy is observed mainly due to the greater tendency of women to choose the answer “I don’t know.” Thus, if one assumes that the answer “I don’t know” does not necessarily indicate a complete lack of knowledge, but rather manifests low confidence, partial knowledge, or ambiguity of

the question, then in fact the gender gap in financial literacy is smaller than the research suggests.

Compared to the other two questions, responses to the third question in the debt literacy test used in the study (the one on the time value of money) are also differently related to non-cognitive factors. The sign of the relationship with the likelihood of answering correctly in the time value of money question was opposite to that obtained in the models for the other two test questions. More specifically, for Q1 and Q2, the relationship between sharing materialistic values (approximated through the statements “I like to have money and buy what I like” and “I would feel better if I could afford more”) and the chances of answering correctly (incorrectly) is positive (negative), while for Q3 the relationship is negative for the chances of answering correctly and positive for the chances of answering incorrectly. The same is true for risk and impulsive buying propensity. For Q1 and Q2, the relationship between risk aversion / risky behaviour (“Life without risk is boring” and “I visit dangerous places and countries”) and impulsive buying (“I buy different things under the influence of ads or commercials”) and the odds of giving a correct (incorrect) answer is negative (positive). The opposite is true for question Q3: the relationship is positive (and negative), respectively. Paradoxically, people with predispositions to problematic or even undesirable financial behaviour are more likely to answer this extremely difficult question correctly (and less likely to answer it incorrectly). This observation is so interesting and important from a practical point of view that it deserves further in-depth research.

Our survey also yielded interesting results in terms of the propensity to answer “I don’t know.” This concerns not only the aforementioned gender gap in financial literacy. Indeed, multinomial models showed that while the odds of answering incorrectly

are significantly related to some non-cognitive variables referring to psychological predispositions, the odds of answering “I don’t know” are significantly related to variables describing saving behaviour. In short, having bank deposits as well as saving for retirement reduces the odds of selecting “I don’t know” in response to the first two questions of the debt literacy test. This likely indicates that financial market experience increases financial confidence, as reported in previous studies (Frijns et al., 2014; Monticone, 2010; Santini et al., 2019). However, saving behaviour is unrelated to the odds of answering “I don’t know” to the last and the most difficult question of this test, thus confirming its unique nature.

The most interesting finding of the study is that the third question of Lusardi and Tufano’s test (the one on the time value of money (Lusardi and Tufano, 2015)) is significantly different from the other two – both in terms of difficulty and in its association with sociodemographic variables and non-cognitive factors. This should have practical implications for financial education. Our results show that very few consumers know and understand the concept of the time value of money and that, unlike their knowledge of other aspects of the effective interest rate, their sociodemographic characteristics such as gender, age or education do not matter in this case. This suggests the need for an extremely strong emphasis on explaining the time value of money mechanism in financial education programmes.

The implications for the academic world are that more research is needed to understand why consumers have so much trouble grasping the concept of the time value of money, and to develop effective educational programmes based on the findings stemming from the research. In a recent paper, Hubbard et al., (2016) report how different education formats regarding compound interest (text, linear graph and volumetric graph) can improve financial literacy. In turn, Porzak et al.,

(2021) used four edugraphics associated with four problems in a debt literacy test (including three of Lusardi and Tufano's questions) conducted in an experimental setting. It seems that understanding why it is so difficult for consumers to comprehend and master the concept of the time value of money requires precisely this kind of experimental research as it allows insights which cannot be obtained in survey studies. It is also worth noting that there is no measurement scale in the literature designed strictly to test knowledge and understanding of the effective interest rate. Even debt literacy, broadly defined, is rarely tested. Future research could go in the direction of designing and using a new measurement scale designed strictly to test what consumers know about and how they understand the effective interest rate.

More research is needed to understand why individuals with a greater predisposition to unhealthy or problematic financial behaviour appear to be more likely to comprehend the nature and implications of the time value of money concept. Above all, it is necessary to check whether the aforementioned effect will also be noted in other research samples. Given the lack of variation in responses to the third question of Lusardi and Tufano's test (Lusardi and Tufano, 2015) by sociodemographic variables, as well as the extremely high degree of difficulty of this question, further research is needed to evaluate its properties as an instrument for measuring financial literacy.

Conclusions

In this paper we present the results of a study on the extent to which borrowers in Poland know and understand the effective interest rate mechanism. For this purpose, we used the three-question test developed by Lusardi and Tufano (2015). We assumed that each question refers to a different aspect of the effective interest rate. The results show that a particularly challenging aspect of the ef-

fective interest rate is the concept of the time value of money. Very few consumers answered the question on this matter correctly. Additionally, the probability of answering this question correctly was differently related to sociodemographic variables and non-cognitive factors compared to the other two questions. This suggests both the need for greater emphasis on the issue of the time value of money in financial education programmes and the need for more in-depth research to understand the uniqueness of this issue from the perspective of developing financial literacy.

While this study brings interesting findings that can make an important contribution to the literature on financial education and financial literacy, it also has some weaknesses. For one, it was conducted on a purposive sample. Although its structure does not differ significantly from that of the adult Polish population, and despite the arguments in favour of purposive (non-probability) samples (Chen et al., 2012; Lehdonvirta et al., 2020), the results of this study should be used with caution given the lack of formal basis for their generalisation.

Constructs such as materialism and impulsive buying already have validated measurement instruments. In our study, we discretionarily assigned to them questions in the survey from which we obtained data. Future research should test whether our conclusions about the links between debt literacy and non-cognitive factors hold true, using validated measurement instruments where possible.

Our study was exploratory in nature. Although we made interesting findings in terms of consumer knowledge and understanding regarding the effective interest rate, our study cannot answer questions about the reasons for the relationships we established. Finally, the data we used are cross-sectional. Therefore, they only allow us to make inferences about relationships but not about causality between variables.

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- Rector of Wyższa Szkoła Biznesu – National Louis University in Nowy Sącz,
- Rector of Warsaw Higher School of Economics,
- Member of Supervisory Board and Managing Board of CIECH S.A., one of the biggest companies listed on the Warsaw Stock Exchange,
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