Determinants of Financial Literacy Among German Students – An Empirical Analysis

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Summary: Financial literacy is very important for social participation. This paper presents an empirical evaluation of the determinants of financial literacy among students at a German university. An additional goal is the identification of gender differences in respect to financial literacy. The evaluation is based on the definition and surveys of financial literacy developed by the OECD, (A. Lusardi & Mitchell, 2014) and (Chen & Volpe, 1998) and the analysis of the "Big Three" questions. The results suggest a rather low level of financial literacy among female students. Additional factors such as a very good mathematics grade and logical thinking have a significantly positive impact on financial literacy. Students in economics are more likely to answer the "Big Three" questions correctly. This finding supports the hypothesis that education in economics helps to acquire knowledge of financial instruments and financial application.

Zusammenfassung: Finanzkompetenzen haben für die gesellschaftliche Teilhabe eine hohe Bedeutung. Dieser Beitrag führt eine empirische Evaluation der Determinanten der Finanzkompetenz von Studierenden an einer deutschen Hochschule durch. Ein weiteres Ziel ist auch die Identifizierung der geschlechtsspezifischen Unterschiede bei der Finanzkompetenz. Die Evaluierung basiert auf der Definition und den Erhebungen zur Finanzkompetenz, die von der OECD entwickelt wurden, (A. Lusardi & Mitchell, 2014) und (Chen & Volpe, 1998) sowie auf der Analyse der "Big Three"-Fragen. Die Ergebnisse deuten auf ein eher geringeres Niveau der Finanzkompetenz unter Studentinnen hin. Weitere Faktoren wie eine gute Mathematiknote und logisches Denken haben signifikant positive Auswirkungen auf die Finanzkompetenz. Studierende der Wirtschaftswissenschaften beantworten die "Big Three"-Fragen mit höherer Wahrscheinlichkeit richtig. Dieses Ergebnis unterstützt die Hypothese, dass die wirtschaftswissenschaftliche Bildung dazu beiträgt, Kenntnisse über Finanzinstrumente und deren Anwendung zu erwerben.

→ JEL classification: A22, D14, D80, D91, G53, I21, I22, I23, I24
→ Keywords: financial skills, Gender, higher education, determinants of financial literacy

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Introduction

According to life cycle hypothesis, financial decisions are essential for the general financial well-being, hence later in life for the retirement income. Several studies reveal that women seem to have consistently less knowledge in financial literacy and a lower score in financial literacy measures (Bucher-Koenen et al., 2017; Hung et al., 2009; Annamaria Lusardi & Mitchell, 2008b; Mottola, 2013). A low financial literacy knowledge may result in negative outcomes in retirement plans, income as a single parent or wealth accumulation. The negative development of the public pension system in Germany demonstrates the necessity to create solid retirement plans and to accumulate financial wealth for the retirement. In particular women with part-time jobs, full time or long-lasting motherhood and family responsibilities have considerably lower retirement incomes.

Low financial literacy of women may lower their access to financial products and their ability to manage assets, building up wealth for retirement and securing a financial future. The paper aims to find out the current state of financial literacy and determinants among young university students with a special emphasize on female students and their financial literacy. This paper is an extension of the work of (Riebe, 2019) about financial literacy among university students. The results suggest that the financial literacy of female students is less pronounced relative to male students indicating in a gender-based difference. Specifically, female students are less likely to answer the financial literacy questions correctly. The study controls for additional factors as personal characteristics, the student's major, math-ability and logical thinking as well as the living situation. The math skills, the logical thinking, being an economic student and speaking German at home increases the probability of high scores for financial literacy. The paper also sheds some light on the perception and uncertainty about the student's financial literacy. The students had the option to indicate, if they do not know the answer instead of guessing the answer. The probability to answer "I don't know" increases with the female gender and with students not speaking German at home. Students with high scores in math and logical thinking are less likely to indicate their uncertainty about the answer.

In this study the measure of financial literacy is based on a set of three questions, which represent the "Big Three". The Big Three are core questions and represent the essential financial concepts of interest rates, inflation and risk diversification. They were adapted worldwide in financial literacy surveys and research and provide a standardized means of comparison across national borders (Annamaria Lusardi & Mitchell, 2008b).

Literature Review and Hypotheses

In order to empirically test the validity of theoretical concepts, it is important to quantify the variables to be investigated in a way that is consistent and adequate with the theory. As in many fields of social science, a comprehensive, unified and generally accepted definition of terms does not yet exist (Hung et al., 2009). In this section, a definition of financial literacy is discussed and a detailed overview of different strands of literature is given.

Financial literacy is often equated with financial knowledge, financial education or financial literacy (Arnold et al., 2018; Mania & Tröster, 2015). According to (Marcolin & Abraham, 2006), there is an increasing need for academic surveys on the most diverse focal points of financial literacy. There is a need for a standardized survey to answer a wide range of questions including a precise

definition and measurement of financial literacy. In her meta study, Huston (2010) shows that in the 52 underlying data samples of the 71 representative studies, about two thirds do not provide a definition of financial literacy and that almost half of the studies use the terms knowledge and competence ("knowledge = literacy" (Huston, 2010, p. 302)) synonymously. After separating the studies, which use knowledge or competence, almost two thirds of the studies use the two terms interchangeably suggesting that the concepts and the measurement procedure are the same. Almost one third of the studies use one or none of the terms knowledge and competence. This highlights the imprecise application of the financial literacy definition: How can a survey on financial literacy be standardized, valid and comparable, if the concept of financial literacy is not clearly defined?

(ANZ Banking Group, 2015), (Chen & Volpe, 1998) and (Huston, 2010) identify four different subject areas in the previous literature. The first topic area includes basic knowledge about money e. g. time value of money, interest rates or inflation. In the second subject area, questions are asked about lending money like mortgage loans, credit cards, consumer loans, leasing, etc. The third topic area covers investments. Here, on the one hand, knowledge of the financial instruments (savings book, shares, funds, bonds) and, on the other hand, knowledge of risk attitude and risk diversification will be determined. The fourth topic area focusses on insurance (insurance products, risk management).

The challenge in the measurement of financial literacy is the gap in the conception and definition of its self because an imprecise description of the concept also leads to measurements that are not adequate for the respective topic. Based on the findings of previous literature we follow a standardized survey design as in (ANZ Banking Group, 2015; Chen & Volpe, 1998; A. Lusardi & Mitchell, 2014; OECD, 2017a).

This study uses a definition of literacy, which – according to the OECD – is the ability to identify, understand, interpret, create, communicate and compute using printed and written materials embedded in different contexts. This includes continuous learning to achieve the goals, developments or advance the knowledge and potential, and to participate in communities and society. The newly added aspect of reading literacy in digital environments is important in this context (OECD, 2018). (Kirsch, 2001) emphasizes the growing importance of and demands on reading and writing skills with the increasing importance of life-long learning. He points out that literacy is a set of skills, knowledge and strategies that individuals build up during their lives in various situations, also in interaction with others and in society. Literacy and financial literacy do not serve as an arbitrary standard for categorizing whether a person is educated or uneducated, but how individuals are able to handle printed and written materials and how these characteristics relate to social needs (also (ANZ Banking Group, 2015; Arnold et al., 2018)).

PISA, an OECD program to measure and evaluate global education systems using the skills and competences of 15-year-olds, uses following two-part definition of financial literacy: The first part defines financial literacy as the knowledge and understanding of financial concepts and their risks and the ability (as well as motivation and confidence) to apply this knowledge to make effective financial decisions. The second part relates to the purpose of the skills and competencies, which is to increase prosperity for oneself and society and to participate in economic life (OECD, 2017b, 2017c). This definition is based on the OECD's definition of literacy and continues it for the financial sector. Huston (2010) points out two dimensions of financial literacy: The understanding, which is the personal financial literacy and the application. According to Huston (2010) financial

literacy is the study of how well an individual can understand and use financial information. Consequently, financial literacy and financial knowledge are basic skills (part of basic education) but are two different concepts. Financial knowledge is a central dimension in the concept of financial literacy nonetheless does not fully represent it. However, many studies (e. g. by (Chen & Volpe, 1998; Annamaria Lusardi & Mitchell, 2007a, 2007b, 2008a)) use financial literacy and financial knowledge as interchangeable concepts.

Huston (2010) portrays individuals as financially literate who have knowledge and the ability to apply that knowledge. However, it cannot automatically be concluded that the individual is financially well off. This is because there are factors that influence financial behavior and financial prosperity. These include among others (cognitive) behavior, family background (including financial prosperity), cultural imprint and economic or social influences (Huston, 2010). Furthermore (Potrich et al., 2015, 2018) describe, that financial literacy is a multi-dimensional concept with socio-economic and demographic influences. Their models for measuring financial literacy and the representation of interrelationships have three main focuses: Financial literacy, financial attitudes and financial behavior and thus also corresponds to the definitions of terms used by the OECD, PISA, ANZ-Survey (Australia) and Huston (2010), among others.

The concept of financial literacy is a multidimensional concept that is part of basic education and can be subject to influencing factors (socio-demographic factors, individual behavior, education and training, etc.). The basis of the present analysis and developed questionnaire is the definition developed by the OECD and continued in PISA:

"Financial literacy is knowledge and understanding of financial concepts and risks, and the skills, motivation and confidence to apply such knowledge and understanding in order to make effective decisions across a range of financial contexts, to improve the financial well-being of individuals and society, and to enable participation in economic life." (OECD, 2017a, p. 87)

(Atkinson & Messy, 2012) note that financial literacy can be parted in financial knowledge, behavior and attitude. For the respective parts, they create a score to indicate the high and low achievers in different countries. Their research is based on the OECD studies. For the financial knowledge score Huston (2010) uses eight questions and tests the robustness. The eight questions are in the field of division, time-value of money, interest paid on a loan, calculation of interest plus principle, compound interest, risk and return, definition of inflation and finally diversification. The last five questions are like the "Big Five" questions. They are complementary to the above-mentioned "Big Three" questions, adding two questions about bonds and mortgage in the analysis (e. g. (Mitchell & Lusardi, 2011; Mottola, 2013)).

The main hypothesis of the study is that there are gender-based differences regarding the financial literacy.

H1:
Financial literacy is affected by gender.

This is in line with (Fonseca et al., 2012), who study the gender-gap in financial literacy, which negatively impact the financial situation from women. Similarly, (van Rooij et al., 2011) identify a negative linking between financial literacy and stock market participation by women. (Annamaria Lusardi & Mitchell, 2008b) found a negative relation between financial literacy and female retire-

ment planning. Accordingly, we expect that females have a lower probability to answer the "Big Three" questions correctly.

(Cameron et al., 2014) describe three cognitive levels of financial literacy – knowledge, comprehension and application. The topics include economic way of thinking, earning income, saving, spending and using a credit card and money management. Furthermore (Kaiser & Menkhoff, 2017) show a statistical meta-analysis with an overview of financial education studies. They compare to two main fields of definition: financial literacy across individuals departs in borrowing and debt management behavior, budgeting and planning behavior, saving and retirement plans behavior, insurance and risk mitigation behavior, remittance behavior and bank account behavior. (Chen & Volpe, 1998) use a survey of personal financial literacy to analyze six topics: general personal finance knowledge, your savings and borrowing, your insurance, your investments, your personal finance opinions, decisions and education and finally demographic questions. This survey is the basis for the survey in our study and in related literature (Atkinson & Messy, 2012; Bucher-Koenen et al., 2017; Cameron et al., 2014; Annamaria Lusardi & Mitchell, 2007b; Xiao & O'Neill, 2018).

We assume that the financial literacy is likely multidimension. Therefore, we formulate five more hypotheses for the empirical study.

H2:
Financial literacy is related on personal characteristics like age, spoken language at home, reading books.

H3:
Financial literacy is related on the living-situation with parents and/or having children.

H4:
Financial literacy is related on education in economics.

H5:
Financial literacy is related on personal finance experience; e. g. holding a securities depot, having short-term depts and the possibility to save money.

H6:
Financial Literacy is affected by formal knowledge (logical thinking and math skills).

Data Source and Research Methodology

Due to the variety of definitions of financial literacy and limited standardization, a questionnaire was developed based on previous literature (Chen & Volpe, 1998; Lührmann et al., 2015; Annamaria Lusardi & Mitchell, 2007a; OECD, 2017a). The questionnaire includes 68 questions that, in line with Huston (2010), contain knowledge and application dimensions. According to the literature, the "Big Three" are important as these questions are widely and globally used to enhance the comparison across the studies on financial literacy (Arnold et al., 2018; A. Lusardi & Mitchell, 2014). The "Big Three" are often considered as a standardized measure of financial literacy (Knoll & Houts, 2012). They include the questions of interest rates, inflation and risk diversification and allowing an overview of the level of financial literacy of the respondents.

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The survey was conducted at the University of Applied Sciences Bremen in Germany. The University of Applied Sciences Bremen offers a high number of bachelor's degree programs. Consequently, the majority of the students are bachelor degree students, which are the subject of the survey. The survey took place in three faculties during regular classes. Since the financial literacy is a personal and sensitive topic, the survey was designed as a paper-pencil survey. The survey language was German. The students could participate voluntarily in the survey and the anonymity of the data was emphasized.

The paper-pencil survey was taken in two survey rounds. The first survey took place in the winter term 2017/18 in two faculties (Computer Science and Economics) and in ten study programs[1]. The second survey was conducted after the beginning of the summer term 2018 in the Faculty of Social Sciences. A total of 192 students across different terms, faculties, study programs, university entrance qualifications and previous financial knowledge participated in the survey. The students were selected randomly and had no knowledge of participating in the survey in advance. The participants are on average 23.7 years old; 50 percent of the students are between 21 and 25 years old.

The aim of the study is to analyze the determinants of the knowledge and skills of university students on financial literacy and to evaluate whether gender-based differences in financial literacy exist. We have an almost equal distribution of the sexes man and woman. In the survey, the question were held: You are ... (1) female (2) male and as a third selection point a free field, which was not filled by any study participants. Thus the evaluation was viewed with the binary gender assignment.

The "Big Three" questions involve basic numeracy skills and the understanding and application of interest rates, compound interest, inflation and risk sharing (Annamaria Lusardi, 2013). The questions are given in the Table 1.

Table 1

The "Big Three" questions in the survey and an additional variable

Variable	Question	Answer options
Y1 (Interest rates)	Imagine you have 100,000 euros on a savings account. On the passbook you will receive 10 percent interest per annum for the next five years. How much money you have on the savings account after five years?	a. More than 150,000 euros. b. Less than 150,000 euros. c. Exactly 150,000 euros. d. I don't know.
Y2 (Inflation)	Imagine that you have 100,000 euros in an account. You get 10 percent interest per year. There is also a tax of 6 percent. Inflation is 10 percent per year. How much will you be able to buy after one year?	a. More than today. b. Less than today. c. Just as much as today. d. I don't know.
Y3 (Diversification)	If you diversify, this means that you divide your money and invest the smaller amounts into several assets. What happens to the risk of losing money?	a. Risk increases. b. Risk decreases. c. Risk remains the same. d. I don't know.
YA	I do not know.	The response of at least one of the questions Y1 until Y3 is "I don't know".

1 Computer Engineering, Mechatronics, European Finance and Accounting, International Study Program Global Management, International Degree Program in Tourism Management, Business Administration, Double Degree Program in Business Administration, International Degree Program in Industrial Engineering and Management, Applied Business Languages

In Table 1, the first question (Y1) involves the application of basic arithmetical knowledge about interest rates. The second question (Y2) addresses a simple financial decision with the knowledge about inflation. The third question (Y3) tests the knowledge about risk diversification. Due to the increasing difficulty level question Y3 is more complex and requires higher background knowledge (Bucher-Koenen et al., 2017). The "Big Three" questions are transferred into binary variables, where 1 indicates that the answer is correct. The variable YA aims to measure the uncertainty of the students about their answer. The variable is 1 if at least one answer is indicated as "I don't know" and reflects the willingness and readiness of the students to reveals the uncertainty about the correct answer.

According to the literature, there are several variables, which may determine the financial literacy. Table 2 presents the variables included in the subsequent empirical study. The variable GENDERFEMALE is in the focus of this study and indicates the gender (1 = female) of the student. Additionally, the age (AGE), the study year (CLASSRANK_1 and CLASSRANK_2), the language spoken at home (FIRSTLANGGERMAN1), the living conditions (LIVINGPARENTS, LIVINGCHILD), the link to books (READINGMORETHEN1), the economic situation (EMPLOYMENT) as well as the opinion on advertising (ADINTENTION) are considered. We follow the previous literature and consider students of economics and students with a non-economic major (ECOSTUDENTYES1). The financial situation and the connection to financial instruments are measured with variables DEPOTYES1, SHORTTERMDEBTYES1, LOANYES1 and SAVINGSYES1. The variables LOGIC and MATHGRADEHSGRADE2 aims to proxy the knowledge of students in formal subject such as math and logical thinking. The four questions applied to define the variable LOGIC are presented in the appendix.

Table 2

Overview about variables included in the empirical analysis

Variable	Question	Answer options	Datatype
GENDERFEMALE	What is your gender?	Female Male Other [free field]	Dummy, Female = 1
ECOSTUDENTYES1	What are you studying?	Free text response	Dummy, Students from Economics faculty = 1
AGE	When were you born?	Month: Year:	Integer, translate into full age
CLASSRANK_1	What term are you in?	Free text response	Dummy, first and second term (first year on university)
CLASSRANK_2	What term are you in?	Free text response	Dummy, third and fourth term (second year on university)
FIRSTLANGGERMAN1	Which language do you speak mainly at home?	a. German b. another language	Dummy, German = 1
MATHGRADEHSGRADE2	Financial planning also has something to do with math. What final grade in mathematics did you have in high school? Please select the respective grade!	a. 1 b. 2 c. 3 d. 4 e. 5	Dummy, grades 1 and 2 = 1

Table 2 *(cont.)*

Variable	Question	Answer options	Datatype
LOGIC	See appendix	See appendix	4 questions decoded into 1 = all correct answers, 0.75 = 3 out of 4 correct answers, 0.5 = 2 out of 4 correct answers, 0.25 = one correct answer, 0 = no correct answer
EMPLOYMENT	Do you have a side job or a student job?	a. Yes b. No	Dummy Yes = 1
READINGMORETHEN1	How many books do you have at home? A bookshelf of 1-meter length contains about 40 books. Please do not count magazines, newspapers and study books.	a. 0–10 books b. 11–25 books c. 26–100 books d. 101–200 books e. 201–500 books f. More than 500 books	Dummy > 100 books = 1
DEPOTYES1	Do you have a portfolio?	a. Yes b. No	Dummy Yes = 1
SHORTTERMDEBTYES1	Have you used your overdraft credit in the last year?	a. Yes b. No	Dummy Yes = 1
LOANYES1	Have you been in debt this last year?	a. Yes b. No	Dummy Yes = 1
SAVINGSYES1	Do you have a savings account?	a. Yes b. No	Dummy Yes = 1
ADINTENTION	Advertising is intended to inform me about the best product.	Likert scale (Don't agree at all) 1 2 3 4 5 (strongly agree)	Dummy Don't agree at all = 1
LIVINGPARENTS	Who are you living with?	Free text response	Dummy Parents = 1
LIVINGCHILD	Who are you living with?	Free text response	Dummy Child / children = 1

The dependent variables Y1 until Y3 are Bernoulli (binary) variables, that indicate whether the student's answer is correct (1) or not (0). The binary variable YA indicates the willingness to indicate the uncertainty about the own answer. The literature suggests to apply limited dependent variable models for the analysis of binary variable (Wooldridge, 2010). We analyze the determinants of the financial literacy by the means of the logit model (Chen & Volpe, 1998). The logit model is a probability model which describes the probability of success, i. e. P(y=1 |**X**) as shown in equation 1. In our case, the model describes the probability of the students to answer the "Big Three" correctly determined by the variables from Table 2.

$$(1)\ P(y=1|\boldsymbol{X}) = G(b_0 + \boldsymbol{Xb})\ where\ G(z) = \frac{\exp(z)}{1+\exp(z)};\ 0 < G(z) < 1$$

We apply the standard maximum likelihood estimation of the parameters $b_i,\ i \in \{1,\dots K\}$ and calculate robust standard errors for the hypotheses testing.[2]

2 We also calculated bootstrapped standard errors and obtained the same significance levels. For bootstrapping see (Varmaz & Riebe, 2019).

Results

Table 3 presents the descriptive statistics of our sample. The variables are described in the table 2. The distribution of female and male students is approximate evenly divided in the sample. Most of the students (46 %) have a major in a study program of the economics department. Approximately 85 % of the students are in the 1st or 2nd year at the university. The students are on average 23.74 years old; 50 percent of the students are between 21 and 25 years old. Approximately 1 out of 4 students is living with their parents, 6 % of the students have at least one child in their household and about 2/3 have at least a student job. Among the financial instruments, the saving accounts are by far the most used (72 %) followed by, somewhat surprisingly, investment portfolios (19 %). The home language is German for 91 % of the students and 1 out of 5 students have more than 100 books at home. Half of the students (51 %) do not think that advertisements ident to inform about the best product.

Table 3

Summary statistics of the four dependent variables and the control variables with mean and standard deviation for 177 valid observations

	Mean	Standard deviation
Y_1	0.67	0.47
Y_2	0.63	0.48
Y_3	0.63	0.48
YA	0.37	0.48
GENDERFEMALE1	0.49	0.50
ECOSTUDENTYES1	0.46	0.50
AGE	23.74	4.14
CLASSRANK_1	0.39	0.49
CLASSRANK_2	0.47	0.50
FIRSTLANGGERMAN1	0.91	0.29
MATHGRADEHSGRADE2	0.51	0.50
LOGIC	0.72	0.27
EMPLOYMENT	0.63	0.48
READINGMORETHEN1~	0.21	0.41
DEPOTYES1	0.19	0.39
SHORTTERMDEBTYES1	0.11	0.32
LOANYES1	0.11	0.32
SAVINGSYES1	0.72	0.45
ADINTENTION	0.51	0.50
LIVINGPARENTS	0.28	0.45
LIVINGCHILD	0.06	0.23

The descriptive statistics for our dependent variables (Y1-Y3 for the "Big Three" and YA) show the proportion of correct answers. Each question is correctly answered by approximately 2/3 of the participants, whereby the question about the interest rates has the highest rate of correct answers. There are about 1/3 of students answering "I don't know" in at least one of the "Big Three" questions. Interestingly, these students do not answer randomly as they could without any penalty.

Table 4 reports the results of the logit regression (1) for each dependent variable. The results for the financial literacy are shown in columns Y1, Y2 and Y3 and suggest that female gender is negatively related to financial literacy. The significance level is for the "interest rate" and "risk diversification" question at 1%. It follows that female students seem to have lower probability to give correct answers suggesting that we can confirm the hypothesis H1. Conversely, the female gender is positively and significantly related to the probability of giving the answer "I don't know". These results are similar to the findings of comparable studies (Bucher-Koenen et al., 2017). According to the German study SAVE (Börsch-Supan et al., 2008), German women are 11.5 percentage points less likely than German men to answer all "Big Three" questions correctly. Interestingly, there is no significant difference between the genders for the inflation. The reasons for this may be the subject of further investigation.

Table 4

Logit regression model with the three different dependent variables for the Big Three questions (only correct answer) and one dependent variable for at least one "I don't know" answer (YA)

Dependent	Y1	Y2	Y3	YA
const	-0.71	0.30	-4.52*	1.16
GENDERFEMALE1	-1.63***	-0.66	-1.49***	1.37***
ECOSTUDENTYES1	1.03**	-0.60	0.95*	0.06
AGE	-0.01	-0.01	0.15**	-0.03
CLASSRANK_1	-0.20	-1.27	-1.15	0.98
CLASSRANK_2	-0.51	-2.07***	-1.72**	1.73**
FIRSTLANGGERMAN1	0.65	1.74**	3.17***	-1.03
MATHGRADEHSGRADE2	0.40	0.76*	0.43	-1.03**
LOGIC	1.41*	1.66**	0.19	-1.10
EMPLOYMENT	0.17	-0.58	-0.34	-0.16
READINGMORETHEN1001	-0.21	0.06	0.00	0.09
DEPOTYES1	-0.09	-0.31	0.23	0.16
SHORTTERMDEBTYES1	0.02	-0.63	0.76	1.14*
LOANYES1	-1.39**	0.32	-0.30	0.05
SAVINGSYES1	0.86*	0.00	0.69	-0.25
ADINTENTION	0.70*	0.32	-0.14	-1.15***
LIVINGPARENTS	-0.74	-0.01	-1.13**	-0.51
LIVINGCHILD	-0.12	-1.00	0.72	-0.44
N	177	177	177	177
McFadden R-squared	24.02%	22.99%	25.80%	25.84%

Note: This Table shows the results for four separate logit regressions. The dependent variables are described in tables 1 and the independent variables in table 2. Standard errors are robust. Significance levels: * significant at 10%, ** significant at 5%, *** significant at 1%.

Students in economics are more likely to answer the "Big Three" questions correctly. This finding supports the hypothesis that education in economics helps to acquire knowledge of financial instruments and financial application, which confirms the hypothesis H4. Logical thinking (LOGIC) and math skills (MATHGRADEHSGRADE2) are positively related to the probability to give correct answers to the financial literacy questions (hypothesis H6). Financial literacy is often regarded to go hand in hand with math ability, which is measured by the final grade in math in high

school (in German: Abitur). The dummy variable MATHGRADEHSGRADE2 is 1, if the student's final grades are 1 (highest grade) or 2 (second highest grade). In the same vein, logical thinking can be associated with higher probability of financial literacy. The variable LOGIC (as shown in appendix) translates the correct answers to four classic questions in logic into a score, where 1 indicates four correct answers and 0 indicates no correct answer at all. Both variables are negatively linked to the probability of indicating the own answer uncertainty as measured by the variable YA.

Regarding the hypothesis H2 and H3, several findings can be reported. Speaking German at home (FIRSTLANGGERMAN1) seems to be another relevant variable. The variable may indicate that domestic students have some educational advantages. However, the variable may simply show that these students are more used to and more comfortable with the German language. The negative relation to the uncertainty about the answer (variable YA) is in line with the interpretation of better understanding of questions in German. The age of the students (AGE) may show, whether experience, likely to be associated with age, helps to answer the financial literacy questions correctly. The results of the logit regressions suggest that the age has limited effect on the financial literacy. It seems to be positively related to the probability to give the correct answer to the diversification question (Y3). The second-year students (CLASSRANK_2) are apparently less likely to correctly answer the "Big Three" and more likely to answer "I don't know" relative to third and fourth year students. The results suggest that second-year students have lower competences relative to first-year students. A further investigation reveals that students in higher semesters tend to come from non-economic fields. This could lead to the conclusion that students from non-economics programs are not able to answer the questions correctly, despite being in higher semesters.

The experience of being employed (EMPLOYMENT) and experienced with financial instruments (DEPOTYES1, SHORTTERMDEBTYES1, LOANYES1, SAVINGSYES1) seem to have neglected effects except for the interest rate question (hypothesis H5). The employment status helps to understand, whether a (student) job has impact in financial literacy, which is seemingly not the case. While the probability of correct answers to the interest rate question increases for students with a saving account, it actually decreases for students with a loan. Students, that do not agree that advertising indents to inform about the best product (ADINTENTION), are more likely to know about the interest rates and less likely to indicate uncertainty. According to the literature, the variable can show whether the students can apply their knowledge in new situations.

(Evans et al., 2010) notes that the likelihood increases of getting a longer and higher education for growing up children with a large number of books at home. The main impact is observed for students with 500 and more books at home. The variable READINGMORETHEN1, which measures if the students have more than 100 books at home, has no significant relation to the probability of correct answers. The living situation of students is considered important as well. The students living with parents (LIVINGPARENTS) and students living with at least one child (LIVINGCHILD) are not more likely to have higher financial literacy.

Summary

Financial literacy has been examined in many studies in a wide variety of countries. Determinants such as education, family background and behavior as well as other characteristics such as gender and social groups are suggested to be important. However, studies often lack a standardized and

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internationally comparable concept of financial literacy. It follows that general conclusions are at least difficult to obtain.

This paper follows a standardized measurement and analyzes the effects of the gender on financial literacy skills (ANZ Banking Group, 2015). The results suggest that female students are less likely to answer the "Big Three" financial questions on interest rates, inflations and diversification. Female students are more likely to indicate that they are not sure about the correct answer by selecting "I don't know" instead of guessing an answer.

In line with the literature, students in economics perform better. Similarly, students with higher grades in math and with higher scores in logical thinking are more likely to give correct answers to the financial literacy questions. Students speaking German at home are more likely to give correct answers, too. A reason may be that these students are more confident to understand the questions and the presented answers.

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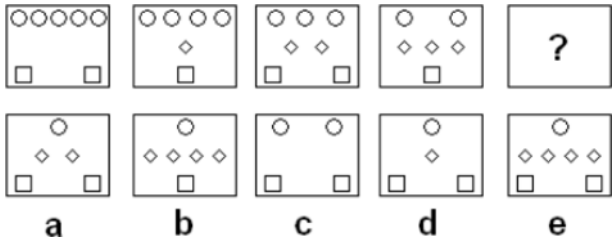
Appendix

LOGIC questions

1. Which number follows in the series 256, 225, 196, 169?
    a. 124
    b. 144
    c. 136
    d. 108
2. Which number follows in the series 1, 3, 8, 19, 42?
    a. 63
    b. 89
    c. 72
    d. 96
3. With which number does the row 25, 37, 51, 67, 85 begin?
    a. 18
    b. 12
    c. 15
    d. 13

4. Which picture follows in the series?



a. a
b. b
c. c
d. d
e. e

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