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Explanations or Advice – The Impact of Financial Literacy on Information Acquisition Behavior

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Julia Sprenger¹

Explanations or Advice – The Impact of Financial Literacy on Information Acquisition Behavior

Abstract

The current study examines individual decision making in the field of personal finance. How do people arrive at a financial decision? A laboratory experiment investigates the way external information is integrated into the decision making process. The objective is to explore the link between financial literacy and information acquisition behavior. The results show that participants with low financial literacy generally try to compensate for their low decision-specific knowledge with a higher demand for external information but give up this strategy when the information environment is restricted to impersonal information. For female participants, low financial literacy increases demand for advice. These findings reveal that a low knowledge base in finance can translate into low engagement in information search which might further increase the risk of low decision quality. The study links these findings to the debate on consumer empowerment and discusses implications for the financial services industry.

JEL Classification: C91, G02, D83

Keywords: Financial literacy; information acquisition; decision making; experiment

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1 Introduction

Financial literacy has been shown to influence financial decisions in various ways, for example with respect to retirement planning (e.g., Lusardi & Mitchell, 2007a) or the propensity to save, to budget and to control spending (e.g., Perry & Morris, 2005). This paper analyses if the level of financial literacy also affects financial behavior at the stage of information acquisition. This stage occurs when people refrain from taking decisions solely on the basis of knowledge stored in memory (internal sources of information) and start using external sources of information to prepare their decision, for example by comparing product information sheets or by consulting a financial advisor.

For many financial decisions external information is not provided in a clear and complete manner but needs to be *collected* by the decision maker. This raises the question when a decision maker considers his search for information completed and which kind of information he chooses to use up to that point. The present work seeks to explore the way financial literacy influences both decisions. Information acquisition behavior prior to financial decision making is of special interest as it might influence the decision outcome and thus help to explain financial behavior.

Two research questions are of key interest:

The first question addresses the compensation of low decision-specific knowledge: Do low levels of financial literacy increase the amount of external information acquired before making a decision?

The second question addresses information preferences: Do low levels of financial literacy generate a stronger demand for advice?

These questions are answered with a laboratory experiment. In the experiment participants have to make a range of financial decisions that require the evaluation of various financial products. The quality of the decision determines the participant's payoff. To prepare their decision participants can use additional information. This information is displayed on demand only and its usage is charged. Two information environments are compared: one group of participants has only explanations of product attributes at choice (impersonal information) while the other group can acquire explanations as well as a recommendation for a certain option (personal information).

The paper contributes to the existing literature in several ways.

In this paper the demand for advice is compared to the demand for explanation in order to analyze how valuable decision autonomy is across different levels of financial literacy. Thereby the paper introduces a new comparison to the experimental literature on advice giving and taking (e.g., Godek & Murray, 2005; Gino, 2008; for an overview see Bonaccio & Dalal, 2006) that so far mainly concentrated on the comparison of advice and observations (e.g., Nyarko et al., 2006; Celen et al., 2010).

In addition, by observing information acquisition behavior in an experiment the paper extends previous research based on stated preferences (e.g., Dalal and Bonaccio, 2010). An experiment allows to include two features financial decisions usually display in reality: Information acquisition is costly and the quality of the decision has an impact on the future financial endowment. Finally, the influence of confidence on information acquisition behavior is taken into account as well.

The results are relevant in a number of contexts. First, they contribute to the debate (see e.g., Williams, 2007; Adkins & Ozanne, 2005) about consumer empowerment and the question how to encourage active information acquisition. The present work explores what kind of information is used by people with low financial literacy and what kind of information is rather ignored. Second, the results are

relevant in the context of financial consulting, revealing which consumers rely most strongly on advice and if they use it in addition to other types of information or as a substitute.

The rest of the paper is organized as follows. Section 2 outlines the theoretical background and the research questions. Section 3 gives a detailed description of the experimental design and introduces the hypotheses. Section 4 reports the experimental results. Section 5 discusses the results and draws a conclusion.

2 Theory and Research Questions

2.1 Financial Literacy

Although there is no standardized definition of financial literacy, knowledge of basic financial concepts is generally considered central to financial literacy (Lusardi, 2008a and 2008b; Lusardi & Mitchell, 2007a; NCEE 2005; Hilgert et al., 2003). While some financial literacy tests include a component that covers basic numeracy (Lusardi & Mitchell, 2007a and 2007b), other studies consider numeracy as a distinct concept (Hung et al., 2009). Huston (2010) has argued that like general or health literacy financial literacy, too, should be conceptualized as having two dimensions- understanding (personal finance knowledge) and use (personal finance application). In accordance with that proposition, in this paper financial literacy refers to both basic financial knowledge and basic numerical skills. In the context of the present work a separation of both components would have been highly artificial as both competencies are strongly entangled (e.g., participants who know what an interest rate is should be able to calculate the interest payment for a given amount of money, a given interest rate, and a given period of time with the help of a calculator).

2.2 External sources of information

In this paper two types of external sources of information are considered: Explanation and advice.

An *explanation* represents a statement or account that makes something clear (Oxford dictionary) and therefore an example for an impersonal source of information. It goes beyond the scope of a definition by introducing the content in a more detailed way. Acquiring explanations is associated with cognitive effort as the user has to derive the implication of the information for the decision problem himself. Explanations therefore represent a type of information that needs to be processed by the user.

Advice, by contrast, is an example for a personal source of information. The term is used here in the narrow sense of a recommendation for a certain action (Dalal & Bonaccio, 2010). As advice prescribes the decision outcome it turns the process of autonomously developing a solution to a decision problem unnecessary. The user only has to treat the information on a meta level, deciding whether to follow advice (compliance) or not (non-compliance). Schotter (2003) uses the term *naïve advice* in case the advisor is no more knowledgeable than the advisee to distinguish it from *expert advice* where the advisor has an advance in knowledge.

2.3 Financial Literacy and absolute demand for external information

On the one hand, one can assume the relationship between the level of financial literacy and the demand for external information to be negative. This idea implies that the demand for external information depends on the user's the objective need for information. If financial literacy is high, information relevant for the decision can be obtained from the internal knowledge base, resulting in a lower demand for external information. If financial literacy is low, the internal knowledge base does not provide a sufficient basis for making the decision, resulting in a higher demand for external

information. Following this line of argument, people with low financial literacy compensate their lack of internal sources of information with a higher demand for external information.

On the other hand, one can assume the relationship between the level of financial literacy and the demand for external information to be positive. This idea implies that the demand for external information depends on the user's subjective capability to process information. Previous research indicates that a lower financial literacy might turn it more difficult to process new information. Akbar (2003) has shown that a shift to higher knowledge levels reduces learning costs for the individual and is associated with positive behavioral dispositions that reinforce learning. Chiesi et al. (1979) found that knowledge in a given domain facilitates the acquisition of new domain-related information. They conceptualize the processing of new information as a mapping process, where new information is integrated into an existing knowledge structure. Literature from behavioral neuroscience supports the idea that knowledge accumulates and that prior knowledge facilitates the processing of new incoming information (Brod et al., 2013).

According to these findings, information acquisition behavior is path-dependent and people with low financial literacy should have a lower demand for external information.

A crucial influence factor to the question if low levels of financial literacy actually decrease or increase the demand for external information is the information environment. The influence of financial literacy on the capability to process information is highly relevant in cases where the information available needs to be processed by the user but can be neglected in cases where the information available does not require active processing. On the basis of the above mentioned arguments I hypothesize that in an information environment restricted to explanations low financial literacy traverses a compensation strategy, leading to a lower demand for external information.

2.4 Financial Literacy and type of information preferred

According to the psychological literature people value decision autonomy and have a preference for information that allows for maintaining decision autonomy. Murray (1938) defined autonomy as a central psychological need that makes individuals striving for independence and avoiding the influence of others. DeCharms (1968) puts it the way that individuals prefer to be the origins of their actions. Ryan (1993) developed a concept of autonomy that goes beyond the mere non-reliance upon others. According to him, autonomy does not refer to the reflexive opposition to any outside influence but to the reflective evaluation of options. Deci and Ryan (1985, 1987, 1991) further refined this approach and shifted the concept of autonomy from an interpersonal process to an intrapersonal process of reflectively weighing outside inputs along with one's own interests and feelings. Koestner and Losier (1996) proposed referring to Murray's conception of autonomy as "reactive" and to Deci and Ryans (1985, 1987, 1991) conception of autonomy as "reflective". In this paper a reactive concept of autonomy is used that refers to the general willingness to integrate outside influences into the decision-making process. According to this concept, demand for explanations should be higher than demand for advice, as advice is a potential threat to the recipient's autonomy (Goldsmith & Fitch, 1997). In line with the above mentioned literature I assume that subjects generally prefer information that allow for decision autonomy and rely on explanations to a greater extent than on advice.¹

However, for low levels of financial literacy the value of decision autonomy might decline. Explanations are more costly with respect to the cognitive effort that needs to be invested in order to process the information. A low internal knowledge base turns it more difficult to process explanations. Therefore,

¹ The focus on this paper is yet on the behavioral consequences of this preference as expressed in demand for advice and explanations and not on directly measuring the importance an individual ascribes to decision autonomy.

low financial literacy might increase the willingness to use advice to prepare a financial decision, even though it violates the need for decision autonomy. On the basis of the above mentioned arguments I hypothesize that a low level of financial literacy decreases the value of decision autonomy, leading to a higher demand for advice.

The linkage between financial literacy and information acquisition behavior is analyzed with an experiment that allows to pursue both research questions. First, it captures the influence of financial literacy on the number of information items acquired before making a decision in order to test if there are limits of a compensation strategy. Second, it captures the influence of financial literacy on the kind of information preferentially used, revealing if the value of decision autonomy varies across different levels of financial literacy. Conflating the results promises to give a detailed insight into the way financial literacy influences the use of external information prior to decision-making.

3 Experimental Design and Hypotheses

The experiment consists of two parts. In the first part, the financial literacy of each participant is ascertained, once by self-assessment and once by a financial literacy test. In the second part, participants have to solve five decision problems from the field of personal finance. At each decision problem they have to choose a financial product out of a set of four or five. The participant's payment depends on the degree to which the chosen product meets the decision criteria defined in the experimental instructions. To better prepare their decision, participants can acquire additional pieces of information. The main purpose of the experiment is to analyze the link between the level of financial literacy as measured in the first part and the information acquisition behavior observed in the second part.

3.1 Financial Literacy Test

At the beginning of the experiment, participants were asked to rate their financial literacy on a scale from zero to five. Five indicated that the participant considered his financial literacy to be very high; zero indicated that the participant considered his financial literacy to be very low. Only integer numbers could be entered.

Thereafter, participants took part in a financial literacy test (see Appendix C).² The test consisted of five multiple choice questions and measured the comprehension of basic economic concepts as well as the competences in basic financial numeracy. After the test, participants learned how many questions they answered correctly. For each correct answer they received € 1.

3.2 Decision problems

3.2.1 Basic design

The second part of the experiment consisted of five subsequent decision problems (see Appendix E). At each decision problem, participants had 10 minutes time to choose a financial product. A counter at the bottom of the screen displayed the time remaining. At some decision problems, participants had different financial products at choice and had to decide for example between depositing their money in a savings account, an instant access savings account or a fixed deposit account. At other decision problems, they had to compare financial products of the same kind and choose for example between different credit cards.

² The questions build on the Financial Literacy Test derived by Lusardi & Mitchell (2006) for the HRS

Table 1: Overview of the decision problems

Problem No.	Task
1	Choose one of the following options to deposit your money.
2	Choose one of the following bank giro accounts.
3	Choose one of the following credit cards.
4	Choose one of the following options to obtain credit.
5	Choose one of the following savings schemes.

For every decision problem, it was necessary to identify the product that met the predefined decision criteria best in order to maximize the payoff.

Example: *Choose one of the following bank giro accounts. These are your priorities:*

- 1. You are not willing to accept an interest rate higher than 10% when using the credit facility.*
- 2. You only accept a giro account at a bank that offers a secure procedure for online banking.*
- 3. After one year the amount on your giro account should have grown as much as possible.*

A table provided information about up to eight attributes of the products. Similar to real-world decisions, participants were required to distinguish helpful from distracting information: while some of information provided by the table were necessary to assess in how far a product meets the decision criteria (e.g., interest rate), others were completely irrelevant for the decision (e.g., the level of deposit protection fund). For every decision problem, participants could call up a calculator on their screen, e.g., to compare costs and returns across several products.

The decision criteria were displayed in hierarchical order. To generate a payoff the chosen option had to meet the first criterion. If the participant chose a product that met the first criterion only, he earned €1 euro. If he chose a product that met the first and the second criterion, he earned €2. If he chose a product that met the first and second criterion and was dominant with respect to the third criterion, he earned €3. Each decision problem entailed one product that met all decision criteria and led to the maximum payment of €3, one product that did not meet the first criterion and led to the minimum payment of €0, and two to three products with moderate fit with the criteria that led to a payment between €1 and €2. To make sure all participants understood this mechanism the instructions entailed a detailed example and the recommendation to analyze the fitness of a product starting with the first criterion.

Participants did not get direct feedback after completing a decision problem. Only after completing the whole series of decision problems, they learned how much they earned in the second part of the experiment. This payoff added up to what they earned in the financial literacy test.

3.2.2 Information environment

Participants were divided into two groups. In both groups the same basic design described above was used. But the groups differed with regard to the information available to subjects.

3.2.2.1 First group: explanations only

Participants in the first group received the task, the decision criteria and the information table with the annotation that all following participants would receive this decision problem as well and they could earn money by giving them advice on which product to choose. The amount of their payoff depended on the quality of their advice. If they recommended a product that met all decision criteria, they earned the maximum of €3. If they recommended a product that only met the first two criteria, they earned 2€. If they recommended a product that only met the first criterion they earned €1. The parallel remuneration system in both treatments ensured that the decision problem was the same for all participants: They had to use the information table to identify the product that had the best fit with the decision criteria in order to maximize their payoff.

The participants in the first group had to tick which product they would advise to the following participants. The wording of their advice was standardized to *“Choose financial product X!”*

In order to better analyze the decision problem, participants could acquire explanations of specific terms (e.g., cash on deposit or APR). Next to each term was a button labeled *“Buy for €0.20”*. If they clicked the button, a box popped up where the term was explained. In total, 19 explanations were available (see Appendix F).

The participants had an initial budget of €4 they could use for information acquisition. They were free to choose how much of this budget to spend on information acquisition before giving an advice. After each decision problem, they saw the amount of their remaining budget. In case the budget was not exhausted, the remaining part added up to the participant’s final payoff.

3.2.2.2 Second group: explanations plus advice

Participants in the second group received the same task, decision criteria and information table as participants in the first group. Only the wording of the answer options differed: in the first group the wording was *“Choose product number X!”* (advice), in the second group it was *“I choose product X!”* (choice).

The participants in the second group had the same initial budget for information acquisition and could buy the same explanations as participants in the first group. Besides, they could acquire two types of advice at each task, naïve advice and expert advice. The naïve advice was next to a button labeled *“Buy for €0.40”*. It had been created as follows: all participants of the first group who had rated their financial literacy with five (very high) were selected. One of them was randomly chosen and his advice was displayed to all participants of the second group who acquired the advice for €0.40.

The expert advice was available for €0.80 and had been created as follows: all participants of the first generation who correctly answered all questions in the financial literacy test were selected. One of them was randomly chosen and his advice was displayed to all participants of the second group who acquired the advice for €0.80. The way advice was created was clearly exposed in the instructions.

With respect to the advice creation mechanism, two considerations were taken into account:

- 1) The participants in the second group know that the enumeration system creates an incentive for the advisor to advise a product that meets all decision criteria. This eliminates the problem of trust that otherwise might influence the participants attitude towards advice. Excluding the incentive problem the analysis of information acquisition behavior can concentrate on the value ascribed to decision autonomy.

- 2) The participants in the second group got no feedback on the quality of their decision after each decision problem but only at the end of the experiment. This eliminates the problem of expectation formation: with a direct feedback after each decision problem solved, participants might arrive at an estimate on the quality of both types of advice, expect this to be constant over all tasks and take it into account when choosing which piece of information to use. That way, the choice between explanation and advice would be blurred by a hidden factor.

3.3 Procedure

The experiment was programmed and conducted with the software z-Tree (Fischbacher, 2007). The experimental session took place in the laboratory of the Ruhr-University Bochum. Each session lasted 90 minutes. Before the experiment started, participants received a copy of instructions explaining the experimental design. The researcher also read the instructions (see Appendix A and B) aloud and gave participants the opportunity to ask questions. Throughout the experiment it was assured that participants could neither communicate with each other nor observe another participant's actions. After the experiment participants filled in a questionnaire recording their gender, age, and field of study. Earnings were paid in private at the end of the session. 66 students from various faculties participated in the experiment. 26 of them were female and 40 were male. The mean age was 24.5 (SD = 2.51).

3.4 Hypotheses

Hypothesis 1: In the first group, the information environment is restricted to information that requires active processing by the user. I hypothesize that financial literacy influences engagement in information acquisition and predict that in this group a low score in the financial literacy test is associated with lower demand for external information relative to participants with a high score in the financial literacy test.

Hypothesis 2: In the second group, participants can choose between different types of external information. I hypothesize that financial literacy influences information preferences and predict that a low score in the financial literacy test is associated with a higher demand for advice relative to participants with a high score in the financial literacy test.

4 Results

In this chapter the experimental data on information acquisition behavior is analyzed against the background of both research questions. At first, the relationship between financial literacy and total demand for information is analyzed across both groups. Thereafter, the influence of financial literacy on demand for explanations and on demand for advice is analyzed for participants in the second group. The chapter concludes with a general comparison of information acquisition behavior in both groups. Descriptive statistics can be found in the first section.

4.1 Descriptive statistics

The mean score in the financial literacy test was 3.75 (SD = 1.06), which is slightly above the mean score in the self-assessment of 3.30 (SD = 0.84). In the second part of the experiment, participants could earn €21 by identifying the optimal product in every decision problem. The mean payment in this part of the experiment was 17.15 (SD = 2.17). The actual payment varied from €11.50 to €21, reflecting a wide range in the quality of decisions. The mean amount of money invested in information

acquisition was €1.08 (SD = 0.87), with a maximum investment of €3.60 and a minimum investment of €0.

Table 2: Summary of results

First group: Information = Explanations			
Second group: Information = Explanations + Advice			
Financial Literacy and number of information items acquired			
	First Group	Second Group	T-test
High financial literacy	5.33 (0.91)	3.95 (0.45)	t(34)=1,471, p=.151
Low financial literacy	2.36 (0.67)	5.37 (0.70)	t(28)= - 3,063, p=.005
T-test	t(27)=-2.588, p= .015	t(35)= 1.764, p=.086	
Investment behavior			
	First Group	Second Group	
Mean number of information items acquired (SD)	3.89 (0.63)	4.56 (0.41)	T-test t(64) = -0.925, p = .359
Mean investment in information acquisition (SD)	0.77 (0.12)	1.32 (0.15)	Mann-Whitney U- test U(29, 37) = -2.471, p = .013
Financial Literacy and preference for a certain type of information			
Second Group:			
Negative correlation between score in financial literacy test and number of advice items acquired $r_s = -.351, p = .033$			
	Mean number of		Wilcoxon test
	Explanation	Advice	
	Items acquired (SD)		
Low financial literacy	4.18 (0.72)	1.18 (0.35)	T = -2.649, p = .008
High financial literacy	3.57 (0.45)	0.38 (0.16)	T = -3.837, p = .001

4.2 Financial Literacy and amount of information acquired

According to the first hypotheses, in an environment, where explanations are the only source of information, participants with a low financial literacy acquire less information than participants with a high financial literacy.

To test the first hypothesis, participants were grouped according to their test result and compared with respect to the number of information items they acquired. A closer look at the results of the financial literacy test revealed, that the first three questions were answered correctly by a great

majority of participants whereas the fourth and fifth question represented a hurdle to many of them (see Appendix D). This sharp drop in the share of correct answers was used to group participants: Participants who answered 4-5 questions correctly are referred to as participants with a *good* test result, indicating a *high* level of financial literacy, whereas participants who answered 0-3 questions correctly are referred to as participants with a *bad* test result, indicating a *low* level of financial literacy. Both groups were nearly equal-sized: 14 participants (48.27%) achieved a bad test result and 15 participants (51.73) achieved a good test result.

In the first group, the mean number of information items acquired was 5.33 for participants with a good test result and 2.36 for participants with a bad test result. The difference between both subgroups has shown to be significant in a T- test ($t(27) = -2.588, p = .015$). This result supports the idea, that a shortage of internal sources of information was not compensated by a higher demand for external sources of information. On the contrary, participants who already had a high knowledge base in that field further increased it through high investments in information acquisition whereas participants with a low knowledge base made fewer efforts to expand their knowledge base. In addition to that, a positive correlation between the score in the financial literacy test and the number of information items acquired was found ($r_s = .489, p = .007$). This result further supports the first hypothesis.

The OLS regression, too, exposes a link between the individual level of financial literacy and the demand for information (see Table 3). The variable financial literacy measures the number of correct answers in the financial literacy test. In all specifications, the level of financial literacy has a significant effect on demand for information. As expected, the coefficient is positive.

Table 3: Financial literacy and information items acquired

Dependent Variable:	(1)	(2)	(3)	(4)	(5)	(6)
Information items acquired						
Age	-.257 (.357)	-.300 (.375)	.002 (.308)	.004 (.316)	-.254 (.352)	.013 (.303)
Economics	-1.992 (1.462)	-2.336 (1.775)			-2.038 (1.436)	
Female_d	.166 (1.360)	.670 (1.443)	.199 (1.384)	.825 (1.361)	-.122 (1.219)	-.137 (1.243)
Financial literacy	1.505** (.695)	1.673* (.935)	1.773** (.678)	2.037*** (.674)		
Self-assessment	-.945 (.722)		-1.122 (.723)			
Confidence					-1.234** (.445)	-1.464*** (.422)
_cons	8.783 (10.114)	6.037 (12.339)	.767 (8.373)	-4.302 (7.923)	10.844 (9.138)	2.957 (7.399)
Observations	29	29	29	29	29	29
R ²	.3891	.3436	.3398	.2735	.3821	.3303
Adj. R ²	.2563	.2343	.2297	.1864	.2791	.2499

*p<0.10, **p<0.05, ***p<0.01

In column (1), the variable financial literacy is supplemented by two more variables that refer to the level of financial literacy: The variable self-assessment is included to control for effects of subjective knowledge on demand for information. The dummy variable economics captures if participants are from the faculty of management and economics in order to control for a potential advantage of studying a related field. But neither of the two variables has a significant influence on demand for information.

The effect of financial literacy on demand for information remains significant when excluding self-assessment in column (2) as well as when excluding economics in column (3). But the adjusted R^2 is lowered by both specifications. In column (4), both self-assessment and economics are omitted, leading to a higher significance of the variable financial literacy but to a lower adjusted R^2 . A surprising result from column (1) and (3) is that the influence of subjective and objective knowledge on demand for information works in the opposite direction. Therefore, in column (5) and (6) the variable confidence is included in order to account for the relationship between subjective and objective knowledge. Confidence is measured as difference between the subjective level of financial literacy as measured by the participant’s self-assessment and the objective level of financial literacy as measured by the test.

Table 4: Conception of confidence

Definition	Label	Explanation
Test Result < Self-Assessment	Overconfidence	Participants think they know more than they actually do
Test result > Self-Assessment	Underconfidence	Participants think they know less than they actually do
Test Result = Self-Assessment	Neutral	Accurate self-perception

The results show that the greater the difference between subjective and objective knowledge, the less information items are acquired. Overconfidence thus seems to lower demand for information.

The OLS analysis also includes a dummy variable for female subjects to test for potential gender effects and a variable that records the age, but neither of the two variables exerts a significant influence on demand for information.

So far financial literacy seems to encourage information acquisition. To ensure that this effect is a distinct feature of an environment where explanations are the only source of information, the same comparison was carried out in the second group, where participants had explanations as well as advice at choice. In the second group, the correlation between the score in the financial literacy test and number of information items acquired was negative and insignificant ($r = -.228, p = .175$). The mean number of information items acquired was 3.95 for participants with a good test result and 5.37 for participants with a bad test result. The difference between both subgroups was not significant (T-test: $t(35) = 1.764, p = .086$). But the reversed pattern of information acquisition behavior indicates that participants with low financial literacy seem to compensate the shortage of internal sources of information with a higher demand for external information when the information environment is no longer restricted to explanations.

4.3 Financial Literacy and preference for a certain type of information

In the second group, the overall demand for information was stronger than in the first group: while participants in the first group bought 3.89 (SD = 0.63) pieces of information on average, participants in the second group bought 4.56 (SD = 0.41) pieces of information on average.

In the second group, both participants with high and participants with low financial literacy acquired more pieces of explanation than pieces of advice: Participants with low financial literacy bought on average 4.18 pieces of explanation (SD = 0.72) and 1.18 pieces of advice (SD = 0.35). Participants with high financial literacy bought on average 3.57 pieces of explanation (SD = 0.45) and 0.38 pieces of advice (SD = 0.16). A Wilcoxon test reveals that participants with low financial literacy acquired significantly more explanations than advice ($T = -2.649$, $p = .008$). The same holds true for participants with high financial literacy ($T = -3.837$, $p = .001$).

Table 5: Demand for explanation and demand for advice compared

	Mean number of explanation items acquired	Mean number of advice items acquired
Low financial Literacy	4.18	1.18
High Financial Literacy	3.57	0.38

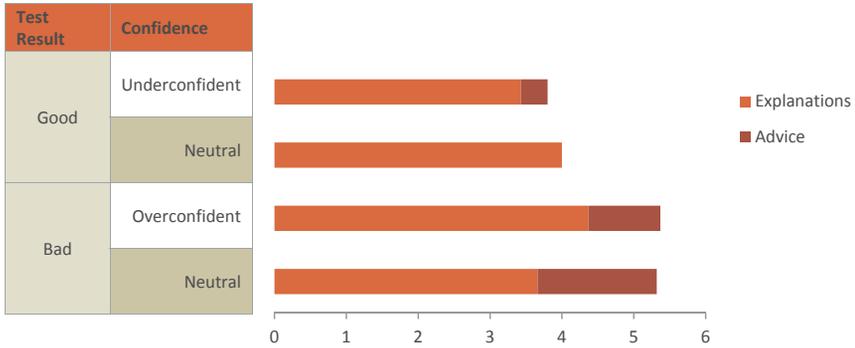
While demand for explanation was generally stronger than demand for advice, demand for naive advice was especially low: only two participants bought naive advice, both of them only one piece before turning back to other types of information. This reveals that most participants using advice were willing to pay for a quality signal that reduced the uncertainty about the competencies of the advisor.

The second hypothesis predicted that in the second group, participants with a bad test result would acquire a higher amount of advice than participants with a good test result. A negative correlation between the score in the financial literacy test and the number of advice acquired ($r_s = -0.351$, $p = .033$) was found, indicating that low financial literacy is accompanied by a higher demand for advice.

In order to better understand the psychological mechanism behind the information acquisition behavior, the individual level of confidence was taken into account as well.

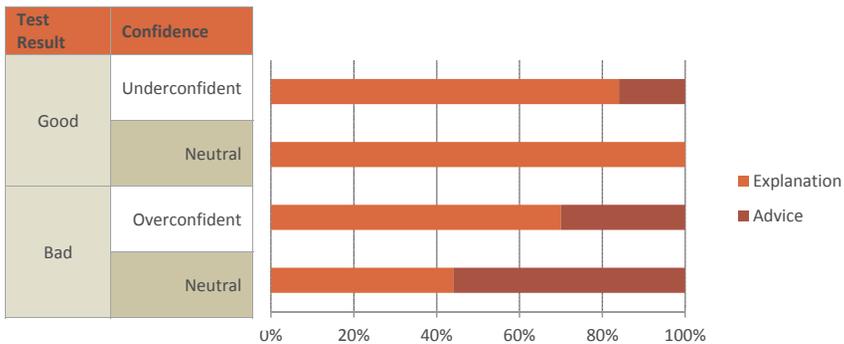
Taking into account the level of confidence revealed that within the group of participants with a good test result, advice was only attractive for the underconfident. As for participants with a bad test result, overconfident participants had a lower demand for advice than participants whose self-assessment was accurate (see Fig. 1).

Fig. 1: Demand for information by subgroup



Solely comparing how many pieces of advice and how many pieces of explanation have been acquired might not be adequate, as advice immediately offers guidance on how to decide, whereas a participant might need to acquire more than one piece of explanation to achieve a position where he is ready to make a decision. Therefore, all subgroups were compared with respect to the question how much of their individual budget was spend on advice and how much on explanations (see Fig. 2). This allows for comparing the mean ratio of advice and the mean ratio of explanation on the investment sum, regardless of the absolute amount of money spend on information acquisition. For participants with a bad test result those with accurate self-perception spent more than 56% of their investment budget on advice whereas those who were overconfident only spend 30% of their investment budget on advice. For participants with a good test result, those with accurate self-perception did not acquire advice at all whereas those who were underconfident spend 16% of their investment budget on advice.

Fig.2: Budget invested in information per subgroup



These results can be used to further refine the second hypothesis: Participants with a low financial literacy acquire a higher amount of advice than participants with a high financial literacy, but overconfidence is lowering the reliance of less financial literate participants on advice. Both financial literacy and confidence are thus included in the OLS regression. Table 6 summarizes the results.

Table 6: Demand for advice

Dependent Variable: No. of advice acquired	(1)	(2)	(3)	(4)	(5)	(6)
Age	.040 (.052)	.029 (.056)	.025 (.054)	.042 (.055)	.030 (.058)	.032 (.058)
Economics	.246 (.337)	.220 (.327)	.256 (.327)			
Female_d	1.138*** (.364)	1.072*** (.349)	1.133*** (.353)	1.153*** (.367)	1.074*** (.354)	1.089*** (.346)
Financial literacy_d	-.004 (.458)	.320 (.353)		.026 (.448)	.292 (.376)	.334 (.346)
Confidence	.179 (.164)			.170 (.167)		
Confidence_d			.137 (.184)		.057 (.187)	
_cons	-.868 (1.666)	-1.105 (1.632)	-.824 (1.519)	-.846 (1.713)	-1.073 (1.662)	-1.076 (1.654)
Observations	37	37	37	37	37	37
R ²	.3274	.3018	.2956	.3157	.2938	.2924

*p<0.10, **p<0.05, ***p<0.01

In all specifications robust estimates are used because of a significant Shapiro-Wilk test. Gender has a strong effect on demand for advice in all specifications, indicating that female participants acquire more advice than male participants do. Other than expected, financial literacy has no effect on demand for advice. The same holds true for confidence, neither when measured as difference between self-assessment and test result nor when taken as a dummy variable that only discriminates between underconfidence, overconfidence and accurate self-assessment.

A closer look at the relationship between the variables female, demand for advice and financial literacy reveals that male and female participants differ with respect to financial literacy. In group 2, there are 19 male participants. 4 (21.05%) of them have a low financial literacy and 15 (78.95%) have a high financial literacy. From the 18 female participants, 12 (66.66%) have a low financial literacy and 6 (33.33%) have a high financial literacy. The same could be observed for group 1. It thus could be that female participants acquire more advice than male participants because they have a lower financial literacy.

Table 7: Financial literacy and gender

Financial Literacy Gender	Group 1		Group 2	
	High	Low	High	Low
Female	2 (25%)	6 (75%)	6 (33.33%)	12 (66.66%)
Male	13 (61.90%)	8 (38.10%)	15 (78.95%)	4 (21.05%)

To test this hypothesis a bootstrapped test of mediation is performed. Table 8 summarizes the results.

Table 8: Gender, financial literacy and demand for advice

Model with dv regressed on iv				
Advice	Coeff.	Std.Err.	P> t	
Female_d	1.175	.326	.001	Observations = 37 R ² = .2700
_cons	.157	.227	.493	
Model with mediator regressed on dv				
Financial Literacy	Coeff.	Std.Err.	P> t	
Female_d	-.991	.356	.009	Observations = 37 R ² = .1812
_cons	4.157	.248	<.001	
Model with dv regressed on mediator and iv				
Advice	Coeff.	Std.Err.	P> t	
Financial literacy	-.182	.154	.246	Observations = 37 R ² = .2988
Female_d	.994	.359	.009	
_cons	.915	.679	.187	
Sobel Goodman Mediation Test				
	Coeff.	Std.Err.	P> Z	
Sobel	.180	.166	.276	
Goodman-1	.180	.174	.301	
Goodman-2	.180	.156	.249	
a coefficient	-.991	.356	.005	Proportion of total effect that is mediated: .1536 Ratio of indirect to direct effect: .1815 Ratio of total to direct effect: 1.1815
b coefficient	-.182	.154	.237	
Indirect effect	.180	.166	.276	
Direct effect	.994	.359	.005	
Total Effect	1.175	.326	<.001	

The results of the Preacher and Hayes test confirm that gender has a strong influence on demand for advice ($b = 1.175$, $t(35) = 3.60$, $p = .001$) and that female participants have a significantly lower financial literacy than male participants ($b = -.991$, $t(35) = -2.78$, $p = .009$). Bootstrapping the results (5,000 replications) reveals that 15.36% of the total effect of gender on demand for advice is mediated but the indirect effect cannot shown to be significant (CI = -.04 to .82).

4.4 Intergroup comparison

Comparing both groups led to the following results: Participants in both groups are very similar to each other with respect to the score in the financial literacy test (first group: $M = 3.68$, $SD = 0.17$; second group: $M = 3.67$, $SD = 0.19$) and the self-assessment (first group: $M = 3.41$, $SD = 0.15$; second group: $M = 3.21$, $SD = 0.14$). The mean number of information acquired is higher in the second group ($M = 4.56$, $SD = 0.41$) than in the first group ($M = 3.89$, $SD = 0.63$), indicating that a wider range of information available stimulates demand for external information. The mean number of explanations acquired is nearly the same in both groups with ($M = 3.83$, $SD = 0.40$) in the second group and ($M = 3.89$, $SD = 0.63$) in the first group. But the level of investment in information has nearly doubled between the first and the second group: $M = 0.77$ ($SD = 0.12$) in the first group and $M = 1.32$ ($SD = 0.15$) in the second group.

5 Discussion

Consistent with the first hypothesis the results of the experiment indicate that in an environment where explanations are the only source of information low financial literacy lowers the demand for information.

The results from the second group indicate that one cannot attribute the low demand for information of participants with low financial literacy in the first group to a desire to save the budget destined for information acquisition. It is an unlikely explanation because in the second group, participants with low financial literacy spend a lot more money to purchase information. As participants from both groups did not differ much with respect to age or gender, the change in the information environment is a more likely explanation for the difference in demand for information.

It is also hard to attribute the low demand for information of participants with low financial literacy from the first group to a low usefulness of the information offered, because participants from the same group but with higher financial literacy used them frequently to better prepare their decisions. A more probable explanation is that the demand of participants with a low financial literacy for information in the first group is low because the information environment is restricted to a type of information whose usability is lowered by low financial literacy.

This leads to the conclusion that participants with a low financial literacy generally try to compensate for their low decision-specific knowledge with a higher demand for external information. But they give up this strategy in case the information available has high processing requirements.

The regression analysis (Table 3) considered different variables referring to financial literacy. Only objective knowledge as measured by a financial literacy test significantly influences the demand for information. Subjective knowledge itself does not influence the demand for information, but the degree to which a person is able to assess his knowledge level accurately does. Therefore, models that include subjective knowledge are preferred over models that omit this variable.

Furthermore the results showed that, in general, demand for explanations exceeds demand for advice, indicating a preference for information that allow for maintaining decision autonomy. But consistent with the second hypothesis low levels of financial literacy leverage this effect by increasing the demand for advice. It is surprising that this effect turned insignificant in the regression analysis (Table 6). One explanation for this is that the effect is hidden by the strong link between gender and financial literacy.

The strong link between gender and financial literacy revealed by the mediation analysis is in line with existing literature: empirical data show that women display lower levels of actual as well as self-reported financial literacy than men (Lusardi & Mitchell, 2014). This difference can only partly be explained by differences in socioeconomic characteristics (Bucher-Koenen et al., 2012) and can be found in a large number of countries (OECD, 2013).

The strong correlation between the two variables financial literacy and gender makes it difficult to estimate their isolated effect on demand for advice. Although all variance inflation factors (VIF) in the regression are <2.1 and thus do not provide strong evidence for a multicollinearity problem, the correlation between financial literacy and gender is reason enough to treat the regression results with care. The correlation between both variables reduces the effective amount of information available to assess the effect of a single predictor. As the sample size is already rather small the statistical power for estimates of single predictors such as financial literacy is easily reduced below the level of statistical

significance. Therefore, both variables are treated as predictors of demand for advice without tearing apart their effects.

6 Conclusion

For many financial decisions people have to seek external information before making their choice. The present work explores in how far their level of financial literacy influences the intensity of this search process and the preference for a certain type of information with a laboratory experiment.

The current paper contributes to the literature on information acquisition and decision-making in several ways:

1. Previous research has shown that maintaining decision autonomy is valuable for decision-makers when making use of external information. This paper shows the limitations of the preference for decision autonomy. For female participants with low decision-specific knowledge the value of maintaining decision autonomy declines. In fact, these participants make use of information that does not allow for maintaining decision autonomy even though this increases the cost of information acquisition, indicating that the value of maintaining decision autonomy becomes negative at some point.
2. It is a reasonable assumption that people with low decision-specific knowledge have a greater objective need for external information and will thus gather more information. This paper shows the limitation of this assumption. As the subjective capability to process information declines for low levels of financial literacy, the exact opposite of compensation eventuates for certain information environments: useful information is ignored because of too high processing requirements.
3. The present work shows that taking into account the level of confidence further explains the patterns of information acquisition behavior. Considering the objective level of financial literacy as well as the level of confidence creates a more complete picture of the forces driving the demand for information.

The current research has implications for two areas:

First, it fits into the debate on consumer empowerment (see e.g., Williams, 2007; Adkins & Ozanne, 2005). The findings suggest that once a critical level of financial literacy is achieved, people start to further broaden their knowledge base by actively obtaining information about product attributes. If they do not reach this point, however, a lock out might occur that results in low search efforts for external information and a low quality of decisions. This implies that ensuring a basic level of financial education in a society might stimulate ongoing learning processes and help consumers achieving a position where they can make well-informed financial decisions.

Second, the findings are relevant for the financial services industry. The results showed that offering impersonal information about product attributes might not be sufficient as this information is often ignored. Therefore, a high usability of impersonal information should be ensured and impersonal information should be accompanied by financial consulting. Previous research has shown that low financial literacy is associated with low levels of trust in financial consulting (Lachance & Tang, 2012) which might act as a barrier to seek professional advice. By contrast, the experimental results showed a strong demand for professional advice among female subjects with low financial literacy. In this setting, where the remuneration system was transparent and excluded any conflict of interest on the side of the advisor, professional advice was far more attractive than naïve advice. This implies that financial consulting could replace the common practice of people with low financial literacy of asking

a friend or family member for a recommendation (Van Rooij, Lusardi & Alessie, 2007) when the problem of low trust is counteracted.

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Appendix

A. Instructions for the first group of participants

Welcome to the experiment!

The experiment is about financial decisions. The experiment consists of two parts (*introductory part* and *main part*) and takes about 90 minutes.

1. Introductory Part

In the introductory part you will be asked to assess your ability to make financial decisions on a scale from 0 to 5. You cannot earn any money at this first step.

The first step is followed by a short financial literacy test. The test consists of five questions. Each question has several answer options. Only one answer option is correct. Please only tick one answer per question. You can earn money by completing the financial literacy test: For each correct answer you get €1. At maximum you can earn €5 by completing the test. The money is paid out after the experiment. It is not possible to lose any money by selecting an incorrect answer option.

2. Main Part

In the main part of the experiment you receive five tasks about financial products. These tasks are given as well to participants of a subsequent experiment. Your job is to give these participants an

advice on how to solve the tasks. By giving an advice you can earn money. At the first four tasks you can earn €3 respectively. The fifth task consists of three sub questions. You can earn €3 at each sub question. In total you can earn €21 in the main part of the experiment.

Please find the task and the decision criteria on the left hand side of the screen. Please select one of the advice items below. Beneath the advice items you find a table with additional information. A short example from a different thematic domain will illustrate the evaluation scheme.

Example:

The participants of the subsequent experiment receive the following task: „You want to take over a godparent hood for a zoo animal. Please select one of the 4 animals listed below. You have 5 minutes time to do so.

These are your decision criteria:

1. (Top priority) You want an animal that is on the Red List of Threatened Species.
2. (Medium priority) You want an animal that does not hibernate.
3. (Low priority) You want an animal as large as possible. “

Please give these participants an advice which animal to choose. You have 10 minutes time to do so.

- Choose animal A!
- Choose animal B!
- Choose animal C!
- Choose animal D!

OK

	Animal A	Animal B	Animal C	Animal D
Name	Leopard (Panthera pardus)	Vancouver Island Marmot	Wildcat (Felis silvestris)	Jaguar (Panthera onca)
Habitat	Africa, Asia	Vancouver Island	Europe, Central Asia	Central and South America
Hibernation	-	6-9 months	-	-
Shoulder height (cm)	70-80	<30	35-40	65

Solution and Evaluation

Please select one advice item. With the OK button you confirm your entry irrevocably. Your earnings depend on the quality of your advice. Try to find an animal that fulfils all decision criteria. Start with the first decision criterion.

Three of the four animals are on the Red List of Threatened Species. If you recommend to choose animal C (the only animal which is not on that list thereby not fulfilling the most important criterion), you earn €0. You should therefore make sure that the first criterion is definitely met. In this case eliminate option C and move on to the next decision criterion.

Only animal B hibernates. If you recommend animal B, you earn at least €1 as the most important criterion is fulfilled (B is on the Red List of Threatened Species). But the advice is not optimal because

the second criterion is not fulfilled (you do not want an animal that hibernates). Therefore, eliminate option B and move on to the next criterion.

With respect to the third criterion animal A fares better than animal D. If you recommend animal A, you earn €3. If you recommend animal D, you earn €2. Only animal A fulfills all decision criteria. Animal D fulfills the first two criteria but is inferior to animal A with respect to the third criterion.

This example is to show you how your decisions and your earnings are related. As the decision criteria are displayed in hierarchical order it is advisable to work through the decision criteria top down. Please note: even if animal C were the largest animal (and thereby dominant with respect to the third criterion), you would earn €0 by recommending it because it does not fulfill the first criterion. Your earnings solely depend on the quality of your advice. It does not matter if your advice is followed.

As you can see from the example, the table contains relevant as well as irrelevant information. In this case the information about the animal's habitat is irrelevant for optimizing the decision. Other characteristics are not listed in the table at all (here: biohazard). In case you need additional information you can draw on the *support items* on the right hand side of the screen.

Support Items

Please find different support items on the right hand side of the screen.

1. Calculator

Please find the calculator icon on top of the screen. Clicking on this icon opens up the calculator in a separate window. You can use the blank pages behind the instruction sheet to take notes or write down calculation steps. Please submit the instruction sheet at the end of the experiment.

2. Explanations

Beneath the calculator icon you will find several explanation items. Next to each explanation item is a button labeled „Buy for €0.20“. Clicking the button opens up a window with a brief explanation of the respective term. All explanations are kept simple and comprehensible. The length of the explanation may vary.

Example: You tend to recommend animal A because it meets the second and third criterion. But you are not sure if that animal is endangered. In that case you could open the explanation item *Panthera Pardis* containing a brief profile of the animal (generic group, appearance, biohazard). The number of explanation items varies across tasks. In total, 19 explanation items are available.

Initial Budget

Your initial budget amounts to €4. You can make use of this budget to purchase explanations. You are free to decide whether to spend the money on explanations or not. You can as well spend it in part only. The budget is not bulked up after each task. As all explanations cost €0.20 you can afford to buy each explanation. After each task the amount of your remaining budget is displayed. If you have looked up two terms at the first task, the information „Your remaining budget is €3.60“ is displayed on your screen before you move on to the second task. If you did not spend your initial budget in total, the remaining budget is paid out to you after the experiment.

Payoff

After the introductory part you get to see how much money you earned so far. This amount is between €0 (you answered no question correctly) and €5 (you answered all questions correctly). After the main part you see how much you earned by completing the five tasks. This amount is at maximum €21 (you always recommended the optimal solution) and at minimum €0 (you always recommended the worst solution). Your remaining budget adds up to your earnings from the introductory part and the main part. The remaining budget is at maximum €4 (you purchased no explanations at all) and at minimum €0.20 (you purchased all explanations available). In total you can earn €30 at maximum. Your earnings are paid to you in cash at the end of the experiment. Please note that you do not have an entitlement to a specific amount of money. How much you earn depends solely on your behavior and on your decisions.

B. Instructions for the second group of participants

Welcome to the experiment!

The experiment is about financial decisions. The experiment consists of two parts (*introductory part* and *main part*) and takes about 90 minutes.

1. Introductory Part

In the introductory part you will be asked to assess your ability to make financial decisions on a scale from 0 to 5. You cannot earn any money at this first step.

The first step is followed by a short financial literacy test. The test consists of five questions. Each question has several answer options. Only one answer option is correct. Please only tick one answer per question. You can earn money by completing the financial literacy test: For each correct answer you get €1. At maximum you can earn €5 by completing the test. The money is paid out after the experiment. It is not possible to lose any money by selecting an incorrect answer option.

2. Main Part

In the main part of the experiment you receive five tasks about financial products. For every task you have 10 minutes time to find the solution. At the first four tasks you can earn €3 respectively. The fifth task consists of three sub questions. You can earn €3 at each sub question. In total you can earn €21 in the main part of the experiment.

Please find the task, the decision criteria, and the answer options on the left hand side of the screen. Beneath the answer options you find a table with additional information. A short example from a different thematic domain will illustrate the evaluation scheme.

Example:

You want to take over a god parenthood for a zoo animal. Please select one of the 4 animals listed below. You have 5 minutes time to do so.

These are your decision criteria:

4. (Top priority) You want an animal that is on the Red List of Threatened Species.
5. (Medium priority) You want an animal that does not hibernate.
6. (Low priority) You want an animal as large as possible.

I choose

- Animal A
- Animal B
- Animal C
- Animal D

	Animal A	Animal B	Animal C	Animal D
Name	Leopard (Panthera pardus)	Vancouver Island Marmot	Wildcat (Felis silvestris)	Jaguar (Panthera onca)
Habitat	Africa, Asia	Vancouver Island	Europe, Central Asia	Central and South America
Hibernation	-	6-9 months	-	-
Shoulder height (cm)	70-80	<30	35-40	65

Solution and Evaluation

Please select one answer. With the OK button you confirm your entry irrevocably.

Your earnings depend on the quality of your answer. Try to find an animal that fulfills all decision criteria. Start with the first decision criterion.

Three of the four animals are on the Red List of Threatened Species. If you choose animal C (the only animal which is not on that list thereby not fulfilling the most important criterion), you earn €0. You should therefore make sure that the first criterion is definitely met. In this case eliminate option C and move on to the next decision criterion.

Only animal B hibernates. If you choose animal B, you earn at least €1 as the most important criterion is fulfilled (B is on the Red List of Threatened Species). But the answer is not optimal because the second criterion is not fulfilled (you do not want an animal that hibernates). Therefore, eliminate option B and move on to the next criterion.

With respect to the third criterion animal A fares better than animal D. If you choose animal A, you earn €3. If you choose animal D, you earn €2. Only animal A fulfills all decision criteria. Animal D fulfills the first two criteria but is inferior to animal A with respect to the third criterion.

This example is to show you how your decisions and your earnings are related. As the decision criteria are displayed in hierarchical order it is advisable to work through the decision criteria top down. Please note: even if animal C were the largest animal (and thereby dominant with respect to the third criterion), you would earn €0 by choosing it because it does not fulfill the first criterion. Your earnings solely depend on the quality of your advice. It does not matter if your advice is followed.

As you can see from the example, the table contains relevant as well as irrelevant information. In this case the information about the animal's habitat is irrelevant for optimizing the decision. Other characteristics are not listed in the table at all (here: biohazard). In case you need additional information you can draw on the *support items* on the right hand side of the screen.

Support Items:

Please find different support items on the right hand side of the screen.

1. Calculator

Please find the calculator icon on top of the screen. Clicking on this icon opens up the calculator in a separate window. You can use the blank pages behind the instruction sheet to take notes or write down calculation steps. Please submit the instruction sheet at the end of the experiment.

2. Explanations

Beneath the calculator icon you will find several explanation items. Next to each explanation item is a button labeled „Buy for €0.20“. Clicking the button opens up a window with a brief explanation of the respective term. All explanations are kept simple and comprehensible. The length of the explanation may vary.

Example: You tend to recommend animal A because it meets the second and third criterion. But you are not sure if that animal is endangered. In that case you could open the explanation item *Panthera Pardis* containing a brief profile of the animal (generic group, appearance, biohazard). The number of explanation items varies across tasks. In total, 19 explanation items are available.

3. Advice

At each task you can resort to two pieces of advice. At the fifth task you can resort to two pieces of advice per subtask.

Next to one advice item you find a button labeled „Buy for €0.40“. If you click the button, a window with a recommendation opens up. For example: *Choose product B!* Next to the other advice item you find a button labeled „Buy for €0.80“. Again, clicking the button opens up a window with a recommendation.

What is the difference between both pieces of advice and where do they come from?

In a previous experiment, participants had to pass a financial literacy test and tasks on financial products as well. The introductory part of the previous experiment was identical to the introductory part of this experiment. In the main part, participants received the same five tasks you are going to receive. Their job was to give a recommendation on which answer to choose. In contrast to you, participants of the previous experiment had no advice items among the support items. But they could buy the same explanations as you. Participants also had 10 minutes time for each task and each explanation had a price of €0.20.

If you buy the advice for €0.80, all participants of the previous experiment who answered all five questions of the financial literacy test correctly are selected. One of them is randomly chosen and his advice is provided to you. All participants who take part in the experiment today receive the same recommendation when purchasing the advice.

If you buy the advice for €0.40, all participants of the previous experiment who reported to be very good in financial decision-making and rated their abilities in this field with 5 (maximum score) are selected. Please note that in selecting the participants the number of correctly answered questions in the financial literacy test is not considered. The selection can include participants with very good test results as well as participants with bad or medium test results. Again, one of the selected participants is randomly chosen and his advice is provided to you. All participants who take part in the experiment today receive the same recommendation when purchasing the advice.

Please note: Participants of the previous experiment have no reason to recommend an answer to you that leads to a low payoff. How much these participants earned depended on the quality of their advice. This implies: If a participant of the first experiment has recommended answer A, and choosing answer A leads to the maximum payment of €3, the participant received €3 for this advice. If choosing the recommended answer leads to a payment of €0, the participant who recommended to do so does not earn anything as well. His payoff is not affected by the question if someone actually decides to purchase his advice or not. All participants of the previous experiment had an incentive to recommend the optimal answer.

Initial Budget

Your initial budget amounts to €4. You can make use of this budget to purchase explanations or advice. You are free to decide whether to spend the money on explanations and/or advice or not. You can as well spend it in part only. The budget is not bulked up after each task. As all explanations cost €0.20 you can afford to buy each explanation. After each task the amount of your remaining budget is displayed. If you have looked up two terms at the first task, the information „Your remaining budget is €3.60“ is displayed on your screen before you move on to the second task. If you purchase an advice for €0.80 at the second task, the information „Your remaining budget is €2.80“ is displayed on your screen before you move on to the third task. If you did not spend your initial budget in total, the remaining budget is paid out to you after the experiment.

Payoff

After the introductory part you get to see how much money you earned so far. This amount is between €0 (you answered no question correctly) and €5 (you answered all questions correctly). After the main part you see how much you earned by completing the five tasks. This amount is at maximum €21 (you always chose the optimal solution) and at minimum €0 (you always chose the worst solution). Your remaining budget adds up to your earnings from the introductory part and the main part. The remaining budget is at maximum €4 (you purchased no support items at all) and at minimum €0.00 (you spend the total budget on explanations/ advice). In total you can earn €30 at maximum. Your earnings are paid to you in cash at the end of the experiment. Please note that you do not have an entitlement to a specific amount of money. How much you earn depends solely on your behavior and on your decisions.

C. Financial Literacy Test

Please answer the following questions by ticking one of the answer options. For each correct answer you receive €1. For each incorrect answer you receive €0.

1. Suppose you have €100 in a savings account and the interest rate is 2% per year. After 5 years, how much do you have in the account if you left the money to grow?
 - More than €102
 - Exactly €102
 - Less than €102
 - Don't know

2. Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, would you be able to buy
- more than today
 - exactly the same as today
 - or less than today with the money in this account?
 - Don't know
3. Please judge the following statement: "Buying a single company stock usually provides a safer return than a stock mutual fund."
- True
 - False
 - Don't know
4. Suppose you deposit €1,000 in a savings account earning 1% per year. The interest is added to your account every quarter (that is every three month) and is subject to interest as well. How much money to you have after 2 years?
- More than €1,020.17
 - Less than €1,020.17
 - Exactly €1,020.17
 - Don't know

Hint:

$1,000 \cdot (1+1/100)^8 = 1,082.85$	$1,000 \cdot (1+1/400)^8 = 1,020.17$	$1,000 \cdot (1+1/400)^2 = 1,005.00$
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5. Suppose you deposit €1,000 in a savings account earning 2% per year. The interest is added to your account every month and is subject to interest as well. How much money to you have after 2 years?
- More than 1,040.77
 - Less than 1,040.77
 - Exactly 1,040.77
 - Don't know

Hint:

$1,000 \cdot (1+2/1200)^2 = 1,003.35$	$1,000 \cdot (1+2/1200)^{24} = 1,040.77$	$1,000 \cdot 1.02^{24} = 1,608.43$
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D. Results of the Financial Literacy Test

Financial Literacy Test	First Group		Second Group	
	Number of correct answers	Number of incorrect answers	Number of correct answers	Number of incorrect answers
Question 1	29	0	36	1
Question 2	29	0	36	1
Question 3	23	6	21	16
Question 4	14	15	18	19
Question 5	17	12	25	12

E. Tasks in the main part of the experiment

Please note: For some financial terms the English expression is more telling than the German equivalent. For example, the term *borrowing rate* clearly indicates that it refers to the amount of money you need to pay in exchange for borrowing money, not to an interest you receive for depositing money. The German term *Sollzins*, by contrast, does not contain the verb for borrowing (German: *leihen*) which makes it harder to interpret the term. In the information table the German expression can be found beneath the English translation.

First group of participants

Task 1

The participants of the subsequent experiment receive the following task:

„You have inherited €10,000 and want to invest the money for the next two years in a safe and riskless way. Please choose one of the four options in the table beneath.

These are your decision criteria:

- 1. (High priority): You want to be sure that you can always access at least part of your money. You want to be able to withdraw up to €1,000 each month as a cushion against unexpected financial needs.*
- 2. (Low priority): You want a return as high as possible. “*

Please give these participants an advice which option to choose in order to arrive at a decision that is optimal according to the decision criteria mentioned above. You have 10 minutes time to do so.

Choose bankbook 1!
Choose bankbook 2!
Choose call money!
Choose cash on deposit!

OK

	Bankbook 1 Sparbuch 1	Bankbook 2 Sparbuch 2	Call money Tagesgeld	Cash on deposit Festgeld
Bank Bank	A	B	C	D
Interest rate Zinssatz	1.5%	1.5%	2.5%	2.5%
Compounding interval Zinsintervall	At the end of year	Quarterly	Monthly	At the end of term
Deposit protection fund Einlagensicherung	100%	100%	100%	100%
Tenor Laufzeit	Not fixed	Not fixed	Not fixed	2 years
Account-keeping Kontoführung	Free	Free	One-off fee of €10	Free
Specials Besonderheit	€80 Starting balance	€80 Starting balance	-	-

Task 2

The participants of the subsequent experiment receive the following task:

„You want to pay €5,000 into a giro account. Please choose one of the five options beneath.

These are your decision criteria:

1. *(Top priority): You are not willing to pay more than 10% interest when using the credit line.*
2. *(Medium priority): You want use the online banking service. Only giro accounts at a bank that provides a secure online banking procedure come into question.*
3. *(Low priority): After one year the amount in your account should have increased as much as possible. “*

Please give these participants and advice which option to choose in order to arrive at a decision that is optimal according to the decision criteria mentioned above. You have 10 minutes time to do so.

- Choose giro account A!
- Choose giro account B!
- Choose giro account C!
- Choose giro account D!
- Choose giro account E!

OK

	Giro account A Girokonto A	Giro account B Girokonto B	Giro account C Girokonto C	Giro account D Girokonto D	Giro account E Girokonto E
Interest rate p.a. Zinssatz p.a.	2.5%	2%	1.5%	3%	1.8%
Starter bonus Starterbonus	0	0	€10	€10	€10
Account management charge Kontoführungsgebühren	€3 per month	-	-	-	€1 per month
Minimum incoming salary deposits Mindestgehaltseingang	0	0	0	0	0
Deposit protection fund Einlagensicherung	€107,052,000	Unlimited	€1,614,000,000	Unlimited	Unlimited
Borrowing rate overdraft facility Sollzins vereinbarter Dispositionskredit	7.9%	9.4%	9.3%	8.5%	12%
Borrowing rate tolerated overdraft Sollzins für geduldete Überziehungen	12%	13.9%	16.9%	13.5%	15.2%
Online banking procedure Onlinebankingverfahren	Sm@rtTAN plus	mTan	HBCI	PIN/TAN	mTan

Task 3

The participants of the subsequent experiment receive the following task:

„Please choose one of the credit cards beneath.

These are your decision criteria:

1. (Top priority): Next year you want to spend a four-month semester abroad at a university in another European country. During this time you want to withdraw money from cash machines and this should be as cost-effective as possible. You exclude the offer that is most expensive in this respect. Assume that you always withdraw €200 to cover the expenditures for the current week.
2. (Medium priority): During the examination period at the end of the semester you want to pause your side job and overdraw your credit card for 4 weeks instead. Doing so should be as cost-effective as possible.

3. (Low priority): After one year your money should have increased. This implies that any dues you have accepted should be compensated by an adequate interest payment. Every month at minimum €1,000 will be kept within your account. “

Please give these participants and advice which option to choose in order to arrive at a decision that is optimal according to the decision criteria mentioned above. You have 10 minutes time to do so.

- Choose credit card A!
- Choose credit card B!
- Choose credit card C!
- Choose credit card D!

OK

	Credit card A Kreditkarte A	Credit card B Kreditkarte B	Credit card C Kreditkarte C	Credit card D Kreditkarte D
Fee (1st year)* Gebühr 1. Jahr	€0	€10	€0	€10
Fee (2nd year) Gebühr 2. Jahr	€0	€0	€0	€0
Interest on credit balances** Guthabenzinsen	2.6%	1%	0%	1.5%
Non-interest payment target Zinsfreies Zahlungsziel	2 weeks	4 weeks	5 weeks	3 weeks
Borrowing rate Sollzins	15%	25%	16%	6%
Cash advance fee (% of transaction amount) Bargeldgebühr in % vom Auszahlungsbetrag	2% Minimum charge: €11	4%	3%	5% Minimum charge: €5

*Due at the beginning of the year

**Credited at the end of the year

Task 4

The participants of the subsequent experiment receive the following task:

„You need €5,000 for your first year in the Master programme. Please choose one of the following options to have this amount at your disposal.

These are your decision criteria:

1. (High priority): Flexibility is important to you. In times when you have spare money you want to be able to make exceptional redemption payments.
2. (Low priority): You want to keep the costs of the credit as low as possible. “

Please give these participants an advice which option to choose in order to arrive at a decision that is optimal according to the decision criteria mentioned above. You have 10 minutes time to do so.

Make use of the call credit!

Make use of the micro-credit!

Charge your credit card!

Overdraw your giro account!

OK

Option 1	Call credit Abrufkredit	Option 2	Mirco-credit Kleinkredit
Credit line Kreditrahmen	300- 25,000	Net loan Nettodarlehensbetrag	€5,000
Minimum amount per call Mindestsumme pro Abruf	50	Tenor in month Laufzeit in Monaten	48
Minimum monthly redemption payment Monatliche Mindesttilgung	0	Borrowing rate p.a. Sollzins p.a.	4.5%
Administrative charge (% of consumed amount) Bearbeitungsgebühr (Prozent des verfügbaren Betrags)	0	APR Effektiver Jahreszins	4.59%
Borrowing rate (percent p.a.) Sollzins (Prozent p.a.)	11.0%	Processing fee Bearbeitungsentgelt	0
APR Effektiver Jahreszins	13.5%	Total amount Gesamtbetrag	€5,472.48
		Monthly installment Monatliche Rate	€114.01

Option 3	Credit card Kreditkarte
Fee, 1st year Gebühr 1. Jahr	0
Fee, 2nd year Gebühr 2. Jahr	0
Interest on credit balances Guthabenzinsen	2.6%
Non-interest payment target Zinsfreies Zahlungsziel	2 weeks
Borrowing rate Sollzins	10% p.a
APR Effektiver Jahreszins	16.8%
Cash advance fee Bargeldgebühren	0
Foreign usage fee Auslandsgebühren	1%

Option 4	Giro account Girokonto
Minimum incoming salary deposits Mindestgehaltseingang	0
Account maintenance charge Kontoführungsgebühren	0
Deposit protection fund Einlagensicherung	Unlimited
Overdraft facility Höhe des Dispokredits	€0- €6,000
Borrowing rate for tolerated overdraft Sollzins für geduldete Überziehungen	15% p.a.
	APR: 17%
Deposit interest Guthabenzinsen	1%
Interest overdraft facility Zinssatz Dispositionscredit	9% p.a.
	APR: 13%

Task 5

The participants of the subsequent experiment receive the following task:

„Please choose one of the saving schemes beneath.

These are your decision criteria:

1. (High priority): You are not willing to accept any uncertainty about the exact level of interest payment.
2. (Low priority): You want the interest to be as high as possible. “

Please give these participants an advice which option to choose in order to arrive at a decision that is optimal according to the decision criteria mentioned above. You have 10 minutes time to do so.

5.1 Which bank do you recommend if the investment period is 4 years?

- Choose Bank A!
- Choose Bank B!
- Choose Bank C!
- Choose Bank D!

OK

5.2 Which bank do you recommend if the investment period is 6 years?

Choose Bank A!

Choose Bank B!

Choose Bank C!

Choose Bank D!

5.3 Which bank do you recommend if the investment period is 8 years?

Choose Bank A!

Choose Bank B!

Choose Bank C!

Choose Bank D!

	Description										
Bank A	The interest rate is variable and is oriented on the 3-month EURIBOR, reduced by a fixed deduction of 3.00% p.a. It amounts to at least 0.50% p.a.										
Bank B	The interest rate is fixed. This applies to both falling and raising market interest rates. The interest rate amounts to 0.25% p.a. for a tenor of 4 years 0.70% p.a. for a tenor of 6 years 1.60% p.a. for a tenor of 8 years The interest is credited to the account on 31st of December and subsequently also accrues interest (compound interest effect).										
Bank C	The interest rate is independent of the investment period. The saving scheme offers an interest rate of 1.45 %p.a. over the entire term. Interest is credited after one year and subsequently also accrues interest (compound interest effect).										
Bank D	The interest is credited to the account on 31st of December subsequently also accrues interest (compound interest effect).										
	In year	1	2	3	4	5	6	7	8	9	10
interest p.a. amounts to	0.60 %	0.60 %	0.85 %	1.00 %	1.30 %	1.50 %	1.70 %	2.00 %	2.20 %	2.50 %	

Second group of participants

For the second group of participants basic elements of the task such as information table and decision criteria are identical to the tasks for the first group.

Example: Task 1

You inherited €10,000 and want to invest the money for the next two years in a safe and riskless way. Please choose one of the four options in the table beneath. You have 10 minutes time to do so.

These are your decision criteria:

1. (High priority): You want to make sure you can always access a part of your money. You want to be able to withdraw up to €1,000 each month as a cushion against unexpected financial needs.
2. (Low priority): You want a return as high as possible.

I choose...

Bankbook 1!

Bankbook 2!

Call money!

Cash on deposit!

OK

F. Explanation items

Task 1

Tagesgeld Call money

Tagesgeld refers to an interest-bearing account with demand deposits that can be called by the account-holder any time. In contrast to a bankbook, there is no cancellation period or limit. The daily deposit availability makes Tagesgeld an ideal alternative for parking money in the short term. As interest rate conditions are fairly attractive, Tagesgeld is often used for long-term deposits as well. In contrast to giro accounts, Tagesgeld accounts are not admitted for payment transactions. Depository transfers can only be made onto the reference account stipulated by the user. Direct debit transactions cannot be withdrawn from the Tagesgeld account as well.

Festgeld Cash on deposit

Festgeld denotes a form of investment where a specified amount of money is deposited at a bank for predetermined period of time at a fixed interest rate. At the end of this period, the deposited amount and the accrued interest are paid out onto the client's bank account. During the investment period one cannot withdraw funds. The level of interest depends on market conditions at the time of concluding the contract as well as on amount and duration of the deposit. In case the Festgeld is not terminated at due date, it is extended automatically by the bank at the actual interest rate and the predetermined period of time. Before concluding the contract, you can opt as well for a transfer of the money on your bank account upon the expiry date.

Zinsintervall Compounding interval

Zinsintervall denotes the frequency of compounding. Usually, interest is credited on an annual basis at the end of year. Some banks offer accounts where interest is credited more frequently. Besides annual compounding, interest can be credited as well after 1, 3, or 6 months. This case is referred to as monthly, quarterly or semi-annual Zinsintervall. In case the interest earned adds up to the available balances, the interest begins earning interest on itself from the next period onwards. The higher the frequency of compounding, the larger the resulting annual interest return.

Task 2	
Kontoführungsgebühren Account management charge	At some giro accounts, Kontoführungsgebühren are incurred. The level can vary depending on the financial institution and the services the bank provides. The bank uses the account management charges in order to settle administrative expenses emerging when establishing and maintaining a giro account.
Dispokredit Overdraft facility	Dispokredit is short for Dispositionscredit. A Dispokredit allows for withdrawing more than you have in your private giro account up to a specified maximum negative balance. The credit line is specified by the provider and depends on the monthly income transferred to the account. Banks usually grant a credit line to private persons amounting to two to three times the monthly income. When making use of the Dispokredit interest accrues daily. Interest is only incurred on the amount of your limit that is actually used.
Geduldete Überziehung Tolerated overdraft	Geduldete Überziehung refers to an overdraft of the giro account that exceeds the overdraft facility agreed with the bank.
Sicherheit im Onlinebanking Security in online banking	PIN/TAN The simple PIN/TAN method is currently considered outdated and insecure. A single free TAN number and the PIN is enough for criminals to get access to your money. The method is particularly vulnerable to phishing, where criminals use a fake mail to pretend to be your bank.
	mTAN The mTAN method is considered technically sound, for one thing, because the transaction number is generated during the request and therefore cannot be stolen beforehand, and for another thing, because TAN and all other relevant data are send per sms to the user's mobile and not to his PC that might be contaminated with malware.
	HBCI The HBCI method offers a high safety standard. Unlike the PIN/TAN method, a TAN is not required for conducting a transaction. The user signs his transaction data with a secret key on his smartcard by inserting the PIN via a smartcard reader. An assailant usually cannot read out the secret key from the smartcard in order to sign own transactions.
	Sm@rtTAN plus and Sm@rtTAN optic These two new methods are considered safe! Analogous to the mTAN method, the generated TAN plus the target account data are displayed again for one to check. If the displayed target account number is not equivalent to the desired target account number, the client can simply cancel the transaction. Unlike the mTAN method, the target account data have to be confirmed via the card reader before a TAN is generated. This offers additional security for the client.

Task 3	
Bargeldgebühren Cash advance fee	If you use your credit card to withdraw money from a bank counter or from an automated teller machine (ATM), a Bargeldgebühr is incurred. Usually, these costs are a fraction of the amount in cash withdrawn. In case the resulting amount exceeds the minimum charge, the minimum charge applies and your account is debited with the minimum charge.
Zinsfreies Zahlungsziel Non-interest payment target	The zinsfreies Zahlungsziel of your credit card designs the period of time during which using the credit line is interest-free.
Sollzinsen Borrowing rate	Interest a bank requires you to pay for borrowing money or for overdrawing your account.
Task 4	
Kleinkredit Micro-credit	A Kleinkredit designs an installment credit with low borrowing amounts. Because of the low credit sum (usually a four-digit euro amount) the creditor faces a manageable credit default risk. Repayment is made every month in equal amounts. Micro-credits often involve an interest burden higher than 20 per cent. Provider justify this with high additional expenditures they face when counseling potential borrowers.
Sollzinsen Borrowing rate	Interest a bank requires you to pay for borrowing money or for overdrawing your account.
Effektiver Jahreszins APR	<p>The effektiver Jahreszins matters with respect to credit transactions as well as with respect to financial investments. For both lending and savings interest rates one has to differentiate between nominal interest rate and effective interest rate.</p> <p>The nominal interest rate represents the mere interest costs of a credit or alternatively the mere interest revenue of a financial investment. The effective interest rate, by contrast, includes all related costs and fees of a financial investment or a credit. Therefore, investors as well as borrowers should use the effective interest rate to compare different offers. The effektiver Jahreszins always refers to a one-year period thereby facilitating the comparison of different offers.</p> <p>All banks over here are obliged to state the effektiver Jahreszins. For investment products such as Tagesgeld or Festgeld, the effective interest rate is either identical to the nominal interest rate or below the nominal interest rate. For credits, the nominal interest rate is usually below the effective interest rate because the effective interest rate includes costs as well as the settlement of the redemption.</p>
Dispokredit Overdraft facility	Dispokredit is short for Dispositionskredit. A Dispokredit allows for withdrawing more than you have in your private giro account up to a specified maximum negative balance. The credit line is specified by the provider and depends on the monthly income transferred to the account. Banks usually grant a credit line to private persons amounting to two to three times the monthly income. When making use of the Dispokredit interest accrues daily. Interest is only incurred on the amount of your limit that is actually used.

Geduldete Überziehung Tolerated overdraft	Geduldete Überziehung refers to an overdraft of the giro account that exceeds the overdraft facility agreed with the bank.
Abrufkredit Call credit	<p>The Abrufkredit is very similar to the overdraft facility. The bank provides a drawing limit to the client he can use when needed. Doing so incurs interest. Similar to the overdraft facility, the interest for the amount taken orientates at the level of market rates. But the interest for the call credit is usually a bit higher than the interest for an overdraft facility. Interest and repayments are paid off in monthly installments. Further costs are optional and many Banks forego account management fees.</p> <p>The level of interest is variable. It depends on income, the credit amount, and the speed this amount is paid off.</p> <p>The credit is variable: On the one hand, paying off the amount at a faster rate than initially planned can save costs. On the other hand, an expansion of the credit amount can lead to higher interest rates. A call credit is most useful when expenditures are to be made and the size of the expenditures cannot be specified completely. The flexible credit line at moderate interest rates offers a high leeway to the credit user.</p>
Task 5	
Zinseszinsseffekt Compound interest effect	Depositing money at a bank usually yields interest because the bank can work with this capital. Depending on the bank and the financial product, interest is credited annual, semi-annual, or quarterly to your investment amount. Zinseszinsseffekt refers to the phenomenon that the interest payments are kept in your account and bear interest itself from the next period onwards. This effect increases exponentially because the amount in your account keeps growing as more and more interest payments add up to it. The more frequent the interest is credited, the stronger the compound interest effect and the higher the return.
Variabler Zinssatz Variable interest rate	A variable interest rate is not fixed but is adjusted to the current market rates. Variable interest rate conditions are often less expensive. But a variable interest rate can become a huge disadvantage when market rates surge. Taken as a whole, variable interest rates lead to a lower planning security.
Zins p.a. Interest p.a.	The abbreviation p.a. stands for "per annum" or "pro anno" and means "per year". One can frequently find this abbreviation in the context of interest rates, underlining that the interest rate applies to a one-year period. Next to <i>Zins p.a.</i> one can find as well the term <i>Jahreszinssatz</i> or <i>jährlicher Zinssatz</i> (annual interest rate).