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DISCUSSION PAPER

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Financial Literacy, Stock Market Participation, and Financial Well-Being in Germany

Leibniz Association

ZEW

Financial literacy, stock market participation, and financial well-being in Germany

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Abstract

We examine financial literacy in Germany and its relevance for financial well-being. Using data from the Panel on Household Finances collected in 2021, we show that about 62% of German households answer the Big Three financial literacy questions correctly. Those with lower education, who are out of the labor force, women, and those living in East Germany have lower levels of financial literacy. Identifying groups with lower financial literacy and developing strategies to reach them and enhance their abilities should therefore be an integral part of the German national financial literacy strategy. Financial literacy is linked to financial well-being: we document that those with higher financial literacy have a higher stock market participation rate and are less likely to report financial difficulties.

Keywords: Financial knowledge, financial well-being, inflation, investment behavior

JEL Classification: G53, D14, G51, I3

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1. Introduction

In recent years, private households in Germany, as in many other countries, have encountered a growing number of financial decisions of increasing complexity. The COVID-19 pandemic, the subsequent outbreak of the war in Ukraine, and the rise of inflation have, in addition to longer-term trends, caused difficult economic challenges for many households. First, about one-third of households in Germany were affected by shocks to their financial situation during the early phase of the COVID-19 induced economic crisis in 2020 (Aprea et al. 2021), and those affected by financial losses in income and wealth had a higher chance of reporting financial difficulties (Aprea et al. 2022). Second, making financial decisions in these times has been challenging for many households. In addition to the high inflation rates, rising mortgage and consumer loan rates have affected borrowers. In contrast, interest rates on typical savings accounts have remained low, requiring savers to invest in longer maturity deposits or riskier investments to achieve positive savings returns.[5] Third, due to the difficult economic environment, higher costs of living, and shocks to income and wealth, an increasing share of households had to rely on assets to cover daily expenses: While around 20% of households reported drawing from savings to cover their expenses in 2020 and 2021, this share was about twice as high in 2022 (Bucher-Koenen et al. 2023). However, financial literacy plays a critical role in helping consumers cope financially with crises such as the recent economic turmoil induced by the COVID-19 pandemic (see, e.g., Lusardi et al. 2011, Cziriak 2022, Wiersma et al. 2020, Klapper and Lusardi 2020, Hasler et al. 2023, Lusardi and Streeter 2023, Chhatwani and Mishra 2021). International research shows that especially those households with less financial knowledge, low education, and low income are more prone to struggling with financial decisions (e.g., Lusardi and Mitchell 2011b, 2014). More generally, lack of financial literacy is associated with poor investment decisions and higher debt costs (e.g., Lusardi and Mitchell 2014, Lusardi 2019, Lusardi and Tufano 2015, Lusardi et al. 2016).

Currently, Germany is one of the few countries in the Organization for Economic Co-operation and Development (OECD) that has not yet implemented a nationwide financial literacy strategy (Bucher-Koenen and Knebel 2021). This is due to change in the upcoming years, however. The Federal Ministry of Finance and the Federal Ministry of Education and Research jointly launched the "Emergence of Financial Education" (German: "Aufbruch Finanzielle Bildung") initiative in March 2023. Three main goals are in focus: i) to establish a national financial literacy strategy for Germany, ii) to provide a

[5] For the differences in interest rates and relevant volumes, see ECB (2023, Table 2). That deposit rates remain low for typical savings accounts despite the rise in the official and the loan rates has also been picked up in the press, e.g., Tagesschau 16.01.2023, PULS 24, 08.05.2023, CNN 06.07.2023.

financial education platform that offers information tailored to the needs of different target groups,[6] and iii) to strengthen scientific research on financial literacy.[7]

In the light of these recent economic and policy developments, we aim to take stock of financial literacy and financial well-being in Germany. Additionally, more than a decade after Bucher-Koenen and Lusardi's 2011 article on financial literacy in Germany, we attempt to provide a current report on financial literacy and relate results to this previous work. We examine a representative sample of German households using the "Big Three" financial literacy questions.[8] These questions measure understanding of interest, inflation, and risk diversification. The analysis is based on data from the most recent wave of the Panel on Household Finance (PHF) collected by the Deutsche Bundesbank. It was collected in 2021 and 2022 and gives insights into the financial situation of German households. We also relate measures of financial literacy to two distinct indicators of financial well-being. First, we examine stock market participation – a financial outcome that has often been studied in the literature on financial literacy (see, e.g., van Rooij et al. 2011, Bucher-Koenen et al. 2021) and which has gained increasing importance in times of low interest rates on savings accounts in Germany.[9] Second, due to the difficult economic environment and the domestic challenges discussed above, we relate financial literacy to an indicator of financial vulnerability; specifically, we use a self-reported measure if households are able to cover their expenses with their income in a typical month (make ends meet).

Our results are as follows: about 62% of German households can correctly answer the Big Three. In comparison, Bucher-Koenen and Lusardi (2011) found that 53% of participants in the SAVE survey correctly answered the Big Three questions – results are based on data collected more than a decade earlier, in 2009. However, the difference is also likely a result of the different survey designs – the most financially knowledgeable person is surveyed in the PHF, compared to a random person in the household in SAVE. We find financial literacy to be relatively stable over time if we compare results to earlier waves of the PHF panel. Financial literacy among respondents is higher for males than females. We find evidence of a (weak) inverted u-shaped pattern by age and a strong increase in financial literacy with more education. As previously documented, we observe a significant difference in financial literacy between respondents in East and West Germany (see Bucher-Koenen and Lusardi 2011 and Bucher-Koenen and Lamla-Dietrich 2018). In addition, financial literacy is closely related to

[6] The online platform https://www.mitgeldundverstand.de/fibi/DE/Home/home.html was launched in December 2023.

[7] Information on current efforts and other initiatives by the Germany Federal Ministry of Finance can be found here: https://www.bundesfinanzministerium.de/Web/DE/Themen/Internationales_Finanzmarkt/Finanzielle-Bildung/finanzielle-bildung.html, last accessed 23.11.2023.

[8] See, Lusardi and Mitchell (2011a, 2011b, 2014).

[9] Schmidt and Tzamourani (2017) and Crossley et al. (2021) examine the role of financial literacy on financial decisions, including owning stocks in Germany. They use linear regressions and do not claim causality.

financial well-being. Those with more financial literacy are more likely to have invested in the stock market. Moreover, those with greater financial literacy are less likely to report financial difficulties.

We contribute to the literature that documents financial literacy using the Big Three financial literacy questions following a scheme that facilitates comparing data both across countries and over time.[10] Additionally, we put a specific focus on inflation literacy. This is highly relevant in light of the recent increases in inflation in Germany and other countries. We also document the relationship between financial literacy, financial well-being, and behavior in the current difficult economic environment. First, we investigate stock market participation, which has been low overall in Germany compared to other industrialized countries (DAI 2022). Given the considerable equity premium, low stock market participation could be costly, especially in times of low interest rates and high inflation. Higher stock market participation can be especially beneficial over long investment horizons, for example when saving for retirement. Thus, participating in the stock market could be a profitable strategy for many households in the current economic environment. While stock market participation in Germany is historically low, there has been a slight increase in recent years. In 2022, the stock market participation rate amounted to 18.3% (DAI 2022); most recent results show a slight drop to 17.6% in 2023 (DAI 2023). Second, the restrictions on economic and social activities induced by the COVID-19 crisis had a negative impact on German households' income and wealth. Cziriak (2022) shows that German households with greater financial literacy have a lower likelihood to be financially vulnerable, i.e., they are better at coming up with the funds to deal with an unforeseen economic challenge. Therefore, we relate financial literacy to a specific measure of financial well-being – namely, if households are in a position to cover their expenses in a typical month (make ends meet).

In light of the ongoing discussions about German financial education strategy, our results have important policy implications: first of all, when discussing a national strategy, identifying relevant target groups is central. For this purpose, it is important to collect and analyze data based on established measures and on representative high-quality data sets. Second, even though the average level of financial literacy is high in Germany compared to other countries, financial literacy is not universal within the country. Thus, measures aiming at increasing financial literacy should target vulnerable groups with lower levels of financial literacy. Third, financial literacy matters for financial well-being: it is both related to the likelihood of investing in the stock market and of making ends meet.

Our paper is organized as follows: Section 2 provides an overview of the data set. Section 3 outlines evidence on financial literacy in Germany based on the Big Three questions with a specific focus on inflation literacy. Moreover, we compare financial literacy in East and West Germany. Section 4

[10] For the papers in the initial project, see Lusardi and Mitchell (2011b) and the papers published in the same volume of the Journal of Pension Economics and Finance. For an update on the project, see Lusardi and Streeter (2023) and the papers published in the same volume of the Journal of Financial Literacy and Wellbeing.

contains empirical analyses of financial literacy and financial behavior, specifically stock market participation and making ends meet. In Section 5 we provide conclusions.

2. PHF Dataset

The Panel on Household Finances (PHF) is a survey on finances and wealth conducted by the Deutsche Bundesbank. The sample is representative of households in Germany and comprises both a panel and a refreshment sample (see Deutsche Bundesbank (2023) for information on the most recent data collection and Appendix A for more details). The first wave was launched in 2010 and 2011 (henceforth PHF 2011) and was subsequently conducted in intervals of approximately three years (i.e., wave 2 in 2014 and wave 3 in 2017, henceforth PHF 2014 and PHF 2017, respectively).[11] Wave 4 was postponed from 2020 to 2021 due to the COVID-19 pandemic. This also led to a change in the mode of the survey: the majority of interviews in wave 4 were conducted by phone (Computer Assisted Telephone Interviewing—CATI), whereas in the previous waves almost all interviews were conducted face-to-face (Computer Assisted Personal Interviewing—CAPI). In our analyses, we will focus on the most recent wave of data, collected in 2021 (henceforth PHF 2021). The total sample size in 2021 comprised approximately N=4,100 households.[12] The majority of these households (approximately 80%) had already participated in at least one of the previous survey waves.

All household-level questions in the PHF, including the financial literacy questions, were answered by the so-called "financially knowledgeable person" (FKP), who was designated at the beginning of each household interview. This is the household member who self-reported as the most familiar with the household's finances (Knerr et al. 2022). As a result, the level of financial literacy measured in our analyses tends to be slightly above the population's average (Bucher-Koenen and Knebel 2021).

In our analyses, we use weights when providing descriptive statistics and regression estimations.[13] We adjust standard errors for imputation error and the survey design. A more detailed description of the PHF data can be found in Appendix A. We report descriptive statistics of the sample in Table A1 and an overview on the inclusion of the Big Three questions across PHF waves in Table A2.

[11] For more details on the data set see: https://www.bundesbank.de/en/bundesbank/research/panel-on-household-finances, last accessed 02.06.2023.

[12] The respective sample sizes for all waves are: N (Wave 1) = 3,565, N (Wave 2) = 4,461, N (Wave 3) = 4,942, N (Wave 4) = 4,119.

[13] We also conducted unweighted regressions as robustness checks and show that the weights do not drive the conclusions drawn from the analyses.

3. Empirical Evidence

3.1. How financially literate are individuals?

The Big Three financial literacy questions used in this study were developed by Lusardi and Mitchell (2011a) and used in the 2004 US Health and Retirement Study (HRS). They have been repeatedly used to measure financial literacy and thus allow for international comparisons and comparisons over time.[14] The exact wordings of the questions are as follows, with the correct answers in bold:

1. *Understanding of Interest Rate (interest)*

   "Let us assume you have a balance of € 100 in your savings account. This balance bears interest at an annual rate of 2%, and you leave it there for 5 years. What do you think: How high is your balance after 5 years?" **Higher than €102**; Exactly €102; Lower than €102; Do not know; Refuse to answer.

2. *Understanding of Inflation (inflation)*

   "Let us assume that the interest paid on your savings account is 1% per year and the inflation rate is 2% per year. What do you think: After a year, will you be able to buy just as much, more or less than today with the balance in your savings account?" More; Just as much; **Less than today**; Do not know; Refuse to answer.

3. *Understanding of Risk and Diversification (risk)*

   "Do you agree with the following statement: 'The investment in the stock of a single company is less risky than investing in a fund with stock in similar companies'?" I agree; **I do not agree**; Do not know; Refuse to answer.

[Table 1 about here]

Table 1 (Panel A) displays the answers to the first question (interest). Of the full sample, 81.0% of the respondents were able to answer this question correctly. About 15.7% gave incorrect answers. A minority of 1.8% indicated that they do not know the answer.[15] Results from earlier studies on financial literacy in Germany find similar results, for example, Bucher-Koenen and Knebel (2021) report 83.2% success on the interest question (see Bucher-Koenen and Knebel 2021 for an analysis of earlier PHF waves as well as a comparison to other surveys in Germany; see Bucher-Koenen and Lusardi 2011 for an analysis based on the 2009 SAVE survey). Table A3 shows the answers to the financial literacy questions for all four PHF waves for the full samples (Panel A) and for the balanced panel of participants across all waves (Panel B). In the PHF 2011, 82.3% answered the interest question correctly, compared

[14] Note that the PHF 2017 and the PHF 2021 also include an additional question about compound interest. We do not consider this question because it is not part of the Big Three financial literacy questions.

[15] The share of respondents who refused to answer the interest question was approximately 1.5%, which was similar for the other two questions. Compared with previous waves of the PHF, the share of non-responses was smaller in 2021.

to 85.9% and 83.2% in the PHF waves of 2014 and 2017, respectively. Overall, we do not find significant learning over time or signs of selection in the data due to attrition.[16]

The answers to the inflation question are shown in Table 1, Panel B. 88.3% of the respondents were able to answer this question correctly; 7.7% gave an incorrect answer and 2.4% stated that they did not know. In earlier studies on financial literacy in Germany, this question also had the highest share of correct answers. Bucher-Koenen and Knebel (2021) report that 86% of the PHF respondents in 2017 correctly answered the inflation question. Bucher-Koenen and Lusardi (2011) report a somewhat lower percentage of correct answers (78%) based on data from 2009. Results based on previous PHF waves show similarly high proportions of correct responses (see Table A3), ranging between 86.3% and 87.7%. We will further discuss past and recent inflation experiences in section 3.4 below.

Table 1, Panel C shows the responses to the question on risk diversification. This question was only presented to about half of the PHF participants. Thus, the results to this question and the overall results on the Big Three only refer to a smaller sample of 2,036 respondents.[17] The results show that 77.1% of the respondents answered this question correctly, 12.8% answered incorrectly and the share of "do not know" responses was 8.1%. Results over time are shown in Table A3. In the PHF waves of 2011 to 2017, around 70.1% of the respondents were able to answer the risk question correctly (Panel A). There was a slight increase to 77.1% in the PHF 2021. Bucher-Koenen and Lusardi (2011) reported a rate of 71% correct answers. The rate of "do not know" responses across surveys was between 12.9 and 14.9% and dropped to 8.1% in the 2021 wave. In the balanced panel (Panel B), the share of respondents who correctly answered the risk question remained stable over time.

Table 1, Panel D gives an overview of the participants' overall performance. Recall that the full sample (N=4,116) answered both the interest and the inflation question. Almost three-quarters of the participants were able to answer both the interest and the inflation question correctly. For the analyses of the Big Three questions, we only included the portion of respondents who received the original risk question as well (N=2,036). More than half of the participants (61.8%) who received the original risk question were able to answer all questions correctly. Only 2.4% answered all three questions incorrectly. 9.6% of the participants answered with "do not know" at least once. Bucher-Koenen and Knebel (2021) reported an overall share of 60.4 % of respondents in PHF 2017 who were able to answer the Big Three questions correctly. Bucher-Koenen and Lusardi (2011) found an overall share of 53% of the respondents in the 2009 SAVE survey with 3 correct answers. Since these surveys are not completely comparable regarding respondents interviewed and survey modes, it is hard to say

[16] Moreover, the change in the survey mode does also not seem to have had a large impact on the responses.

[17] The reason for this is that PHF 2021 contained a survey experiment that modified the wording of the risk question. The alternative wording was assigned randomly across the two subsamples. We are not using the subsample which received the alternative wording here.

what drives this higher share of correct responses observed in PHF 2021 compared to earlier surveys. As already stated, Germany had not implemented a national strategy for financial literacy at this time.

Table 1 also includes the data on financial literacy for a restricted sample of individuals aged 25-65. We are reporting these results to allow for a better international comparison because not all country-specific samples use the same age range for their analyses. The respondents between the ages of 25 and 65 showed a slightly higher likelihood to correctly answer the interest and risk questions. The share of respondents correctly answering the inflation question is similar to that of the full sample. Overall, the likelihood of answering the Big Three questions correctly was 65.5%, which is slightly higher than the overall sample. This could be related to the relationship between financial literacy and age, which we will discuss in the next section.

3.2. Who knows the least?

In this section, we analyze financial literacy by household socio-demographic characteristics and primarily focus on those with low levels of financial literacy. Table 2 shows the how answers to the financial literacy questions differ across different characteristics. Specifically, we examine financial literacy by age, gender, education, and labor market status. We also compare financial literacy between respondents living in East and West Germany in section 3.3. The first two columns of Table 2 report the responses to the interest and the inflation questions for the complete sample of 4,116 respondents. Columns 3 and 4 pertain only to participants who received the risk question (N=2,036).

[Table 2 about here]

Age. Overall, our findings confirm the well-established hump-shaped pattern of financial literacy over age.[18] This hump shape has already been documented in data for Germany by Bucher-Koenen and Lusardi (2011) and Bucher-Koenen and Knebel (2021). When looking at the three questions separately, we find that the age patterns differ regarding knowledge about interest, inflation and risk. Knowledge about interest is shown to decrease with age and is highest for 18-35 year-olds (90.2% correct). Inflation knowledge is highest for the age groups 51-65 (91.0% correct) and >65 years (88.5% correct). Knowledge about risk diversification is rather constant across ages 18-65 (approximately 79% correct) and declines among respondents older than 65 years (71.1% correct). These question-specific age patterns are very similar to the patterns documented previously by Bucher-Koenen and Lusardi (2011). Overall, this could be explained by the fact that answering the interest question is highly related to numeracy skills, which might be higher in the youngest age group, while answering the interest and the risk question requires more experience and, thus, is higher among the middle and older age groups.

[18] We cannot differentiate between age and cohort effects. Financial literacy is most likely related to both.

Gender. The well-known gender gap in financial literacy is also evident in the PHF 2021. Women consistently perform worse than their male counterparts. While 85.0% of men answer the question on interest correctly, only 76.4% of women do so. For inflation knowledge, the gender gap is slightly smaller (90.3% correct for men vs. 86.0% correct for women). For the risk diversification question, the overall performance level is lower, but men still outperform women (80.4% correct for men vs. 73.3% correct for women). It is also noteworthy that the share of "do not know" responses is significantly higher for women than for men, which has also been documented in the literature (see, e.g., Bucher-Koenen et al. 2017 for a review). Overall, the share of women who chose "do not know" at least once is 13.5% while it is only 6.2% for men. Women displayed the most uncertainty (relative to men) when confronted with the risk diversification question. Their share of "do not know" responses is almost twice that of men (10.9 vs. 5.6%).[19]

Education. Financial literacy is highly correlated with education. We follow the International Standard Classification of Education (henceforth ISCED 1997) to define individuals' highest level of education. In the PHF data, separate variables are used to measure schooling and vocational education and training, which are combined here. The majority of respondents completed vocational education (59.5%), 27.6% have a university degree, 9.6% have lower secondary education or less and no occupational training, and a small group (3.3%) have upper level secondary education but no further degree. We separate the responses to the financial literacy questions by education: Only 37.2% of respondents with lower secondary education or less were able to answer all Big Three financial literacy questions correctly. Approximately one in five (21.4%) indicated they "do not know" at least once. Contrasted with those with tertiary education, 76.2% were able to answer the Big Three correctly. The share of "do not know" responses decreased to 4.3%. A similar pattern can be seen when looking at the three questions separately.

Labor market status. Retired individuals and those without employment (i.e., all non-retired individuals who were not participating in the labor market and not yet retired at the time of the survey)[20] demonstrated the lowest levels of financial literacy. Only 49.4% and 60.6%, respectively, were able to answer all three financial literacy questions correctly. On the other hand, employed respondents (whether self-employed or earning a wage or salary) were more likely to answer all questions correctly (68.4% and 68.3%, respectively). Similarly, the share of "do not know" responses was approximately three times higher for retirees and non-employed respondents than for the employed group.

[19] For an investigation of the relation between confidence and financial knowledge, see, e.g., Bucher-Koenen et al. (2021).

[20] This group consist of individuals who are out of the labor market at least temporarily: 18% are on parental leave or long-term sick leave, 32.2% are unemployed, 30% are still in school or at university, 19.7% are homemakers.

Even though the overall proportion of correct answers is relatively high by international metrics, there are distinct differences in the level of knowledge between the domestic groups. Those with lower education, out of the labor force, and women exhibit lower levels of financial literacy. Similar patterns have already been documented by Bucher-Koenen and Lusardi (2011), which have not fundamentally changed in the time since. Even though Germany does not have a national financial literacy strategy in place, some states have introduced economics (sometimes alongside other topics such as law or politics) as a compulsory or elective subject in schools in the past years (see Bucher-Koenen and Knebel 2021 for discussion). The impact of these changes on financial knowledge will likely become visible in the future.

3.3. Financial literacy in East and West Germany

Within the German data, there is a noteworthy comparison to be drawn between the results of respondents living in eastern Germany to those of their western counterparts. From 1949 to 1990, Germany was separated into two separate countries – the Federal Republic of Germany (FRG) in the West and the German Democratic Republic (GDR) in the East. Although the reunification between the East and West took place over 30 years ago, economic differences between these two parts of Germany can still be observed today: there are, for example, disparities in wages (Bossler and Schank 2023), inflation expectations (Goldfayn-Frank and Wohlfahrt 2020), employment rates (Barth et al. 2020), and attitudes towards financial markets (Laudenbach et al. 2023). Differences in the levels of financial literacy between East and West Germany have previously been documented by Bucher-Koenen and Lusardi (2011) and Bucher-Koenen and Lamla-Dietrich (2018). To best ensure an analysis in line with the previous literature, the respondents' current residence was used to draw the distinction between East Germans and West Germans.

[Table 3 about here]

Individuals currently living in Western Germany are more financially literate than those living in Eastern Germany. Table 3 shows the relationship between socio-demographic characteristics and financial literacy within and across former East and West Germany. 63.5% of Western residents were able to answer all three questions correctly. In the East, the corresponding percentage was 55.2%. This pattern is consistent with the analysis of the individual questions. Moreover, the share of "do not know" responses is higher for residents of Eastern Germany than those living in the West (results not shown here). For both Eastern and Western Germany, a hump-shape distribution in financial literacy in terms of age is observable: The age group from 36-50 was most likely to answer all three financial literacy questions correctly in both East and West. Interestingly, the East-West gap in answering the Big Three question correctly is the largest among the oldest age group (14 percentage points), and the second

largest among the youngest age group (10 percentage points). Thus, based on this data there is no indication that the difference in financial literacy between East and West will change for the young who grew up under a similar political and economic environment. Overall, men in the West were significantly more likely to answer the Big Three questions correctly than men currently living in the East. The gap was even wider for women (56.9% in the West vs. 47.5% in the East). For education and employment status, we observe similar patterns as were documented in Table 2.[21] These results are in line with findings from Bucher-Koenen and Lusardi (2011) and Bucher-Koenen and Lamla-Dietrich (2018) which are both based on SAVE data collected in 2009.

3.4. Financial literacy and inflation

In the past two years, inflation has dramatically increased in many countries, including Germany. Price hikes have led consumers to become conscious of growing inflation. For many households in Germany, this rise in inflation was a new experience. Historically, individuals living in West Germany during the 1970s experienced comparatively high inflation, but rates have been rather low since then.[22] In comparison, East Germany had inflation rates around zero until 1989 (Berlemann and Enkelmann 2013). After the reunification in 1989, inflation rates in the East started moving in tandem with those in the West, which ranged between one and five percent in the 1990s. Figure 1 displays the development of the inflation rate since 1997. Most recently, there was a dramatic increase in inflation following the COVID-19 pandemic, increasing from 3.1 in 2021 to 6.9% in 2022. However, these recent developments are not yet fully captured in our data set, as data collection took place between April 2021 and January 2022, thus ending just before the steepest increase in inflation rates.[23]

[Figure 1 about here]

Table 4 shows OLS regression results of a correct answer to the inflation question and socio-demographic characteristics.[24] Column 1 shows the baseline results. Column 2 contains a dummy for current residency in East or West Germany. In Column 3, we include additional dummies for country of residency in 1989, i.e., whether the respondent lived in East or West Germany or elsewhere at that time. This allows us to more accurately discern respondents' previous experience with inflation.

[Table 4 about here]

[21] Note that for some of the sub-groups from the East, namely those not employed, self-employed and with upper secondary education, the number of observations becomes very small (less than 30).

[22] Source: Deutsche Bundesbank. https://www.bundesbank.de/en/tasks/topics/inflation-lessons-learnt-from-history-666006, last accessed 07.06.2023.

[23] Two thirds of the sample were collected between April and June 2021; 20% of the sample was collected between July and September 2021. All but ten interviews had been conducted by the end of 2021.

[24] Table A4 shows analogous regression results using other financial literacy metrics such as correct responses to the interest question, the risk question or "do not know" responses.

We find statistically significant age effects: Compared to the 36-50 year-old age group, older individuals (51-65 years) were more likely to answer the question on inflation literacy correctly. The effect becomes slightly stronger for individuals older than 65 years. This reflects a potentially longer experience with inflation and a higher likelihood of personally having experienced times of high inflation previously in life.[25] In the first two specifications (Columns 1 and 2), women were less likely than men to answer the inflation question correctly. This is consistent with the descriptive evidence from Table 3. However, when adding controls for residency in 1989, the effect of gender is no longer statistically significant (Column 3).

Compared to employed respondents, those not employed or retired were less likely to answer the inflation question correctly. Note that this effect is conditional on controlling for age. Thus, it captures the effect of being out of the labor force beyond the age effect. Moreover, individuals with lower secondary education or less were significantly less likely to give the correct answer than those with higher levels of education. These results suggest that education and participation in the labor market play an important role in understanding inflation.

While current residency does not have a statistically significant impact on inflation literacy, the place of residency in 1989 appears to be important. The reunification of former East and West Germany took place in 1989 and was followed by an increase in inflation rates, especially for residents in the East. East Germany was a socialist state that aimed to shield its citizens from price fluctuations. Our results show that individuals who lived in East Germany in 1989 were less likely to answer the inflation question correctly compared to those living in West Germany in 1989 (Column 3). This finding coincides with Beckmann and Kiesl-Reiter (2023) who analyze the relationship between inflation experiences and inflation literacy in Eastern Europe.

Especially in current times of rising prices, vulnerable groups have to be able to understand the concept of inflation and act appropriately. Our results emphasize, however, that individuals with lower education levels and those who are out of the labor force lack the most knowledge, underlining the importance of adequate financial literacy. Targeted financial education in this respect is crucial.

4. Does financial literacy matter?

In this section, we focus on whether financial literacy plays a significant role in making financial decisions. Earlier literature on financial literacy in Germany related financial literacy to pension planning (Bucher-Koenen and Lusardi 2011). In this paper, we focus on two additional measures of

[25] This is in line with Ehrmann and Tzamourani (2012), who show that the likelihood of being concerned about rising prices (which generally suggests understanding of inflation) is closely related to the extent to which an individual has already experienced high inflation.

financial behavior, namely stock market participation and whether households are able to cover their monthly expenses (making ends meet). Stock market participation and portfolio diversification have already been examined in the literature on financial literacy and have been shown to be strongly influenced by financial literacy (see, e.g., van Rooij et al. 2011, Almenberg and Dreber 2015, Bannier and Neubert 2016, Bucher-Koenen et al. 2021, Bianchi 2018 and von Gaudecker 2015). For Germany, Schmidt and Tzamourani (2017) and Crossley et al. (2021) examine the effect of financial literacy on financial investments and other decisions and find a positive correlation between financial literacy and owning securities (bonds, stocks or mutual funds). Stock market participation in Germany is traditionally low compared to in countries such as the US, the UK or Sweden. However, low interest rates on savings accounts and other safe investments have increased attention towards investments in risky assets, with participation rates recently starting to increase, especially among the young (e.g., Jonas et al. 2022 and DAI 2023).

Moreover, the recent crises have increased attention towards individuals' ability to withstand financial shocks. Klapper et al. (2013) find that low levels of financial literacy were associated with a reduced ability to come up with funds for emergency expenses during crises. This shows that financially illiterate individuals are more prone to suffer from economic crises. More recent contributions show that financial literacy is associated with the ability to cope with economic and financial crises such as those caused by the recent COVID-19 pandemic (see, Cziriak 2022, Wiersma et al. 2020, Klapper and Lusardi 2020, Hasler et al. 2023, Lusardi and Streeter 2023, Chhatwani and Mishra 2021). In the PHF data, we can measure financial well-being by the self-reported measure if households make ends meet in a typical month.

4.1. Stock market participation

We measure stock market participation as a dummy that equals 1 if the household owns stocks and equity funds, and 0 otherwise. Table 5, Panel A provides descriptive statistics. In Table 6, we use the stock market participation dummy as the dependent variable and run linear probability models, controlling for financial literacy and socio-demographic characteristics (Table 6, Columns 1-3). Finally, we implement an instrumental variable (IV) approach, using financial literacy levels from the previous wave (PHF 2017) as instruments (Table 6, Columns 4-5). This strategy allows us to tackle measurement error inherent in the financial literacy measure. It also allows us to control for endogeneity problems to a limited extent. This means that for individuals who developed their financial literacy skills before 2017 and started investing between 2017 and 2021 we can estimate a causal effect. However, endogeneity is still present due to omitted variables and reverse causality beyond what we can control for by using financial literacy between waves 2017 and 2021.

[Table 5 about here]

Overall, 23.1% of respondents in our sample directly or indirectly own stocks. This is slightly higher than the average reported for the German population. In 2021, 17.1% of the German population aged 14 and over were invested in the stock market (DAI 2021). Stock ownership is highly correlated with financial literacy. We find that 86.4% of stock owners were able to answer the questions on interest and inflation correctly, while only 71.2% of those without stocks were able to do so. This knowledge gap persists when looking at the Big Three questions: 76.5% of stock owners were able to answer all three questions correctly. Only 57.4% of participants not owning stocks were able to do the same. The difference in financial literacy between the two groups is significantly different from zero ($t=5.40$, $p<0.001$). The share of respondents answering with "do not know" at least once among the Big Three is also much lower for stock owners than those not participating in the stock market.

[Table 6 about here]

Next, we look at the relationship between stock market participation and financial literacy in a multivariate analysis. Table 6, Columns 1-3 show results of an OLS regression for the full sample. In the first specification, all three financial literacy questions are included individually. In the second specification, financial literacy is measured by a dummy for answering all three questions correctly. In the third specification, financial literacy is captured by the number of correct answers ranging from 0 to 3. As control variables, we include the socio-demographic variables discussed before – namely age, gender, education, and employment status. Additionally, we insert controls for the number of children, marital status, whether respondents live in former East or West Germany, risk tolerance,[26] and net income quintiles.

We find that inflation knowledge in particular is highly correlated with stock market participation (Column 1). Individuals who answer the inflation question correctly are more likely to invest in the stock market. We find that the likelihood of stock market participation increases with the ability to answer all Big Three financial literacy questions (Column 2) as well as with an increasing number of correct answers to the Big Three (Column 3).

When looking at the controls, we find that individuals with three or more children are less likely to invest in the stock market compared to individuals without children. Individuals older than 65 years are more likely to participate in the stock market compared to 36-50 year olds. Stock market participation is also more likely among participants with tertiary education compared to participants with a vocational degree. Divorced and widowed individuals are less likely to participate in the stock

[26] Risk tolerance is measured based on the following question: "If savings or investment decisions are made in your household: Which of the statements on the list best describes the attitude toward risk? 1- We take significant risks and want to generate high returns. 2- We take above-average risks and want to generate above-average returns. 3- We take average risks and want to generate average returns. 4 - We are not ready to take any financial risks." We merged the first two categories in our empirical analysis since few respondents reported that they take significant risks.

market than singles, which could be related to an increased level of financial stress due to a divorce or the death of a spouse.

Importantly, and in line with the theoretical literature, households' willingness to take financial risks plays a crucial role in the decision to invest in the stock market. With below average willingness to take risks as a reference category, we find that households with above-average willingness to take risks are more likely to participate in the stock market, and those who are not willing to take any risks are less likely to participate. These effects are statistically significant on the 1% level. Furthermore, sufficient financial means are required for participating in the stock market. Our regression results reveal a clear picture here. With an increase in net income, the likelihood of stock market participation increases significantly. The findings hold in all specifications.

In order to address endogeneity concerns, we implement an IV estimation. These endogeneity concerns could stem from various sources. First, there could be measurement error in the financial literacy variables. This measurement error biases the estimated coefficients of the financial literacy variables. Second, there could be reverse causality, because a willingness to invest in the stock market could create an incentive to improve financial literacy. Moreover, omitted variable bias due to missing measures of ability could have led to bias in the results. In order to address the measurement error problem and parts of the reverse causality problem, we use the panel structure of the PHF and instrument financial literacy in the PHF 2021 by using the answer scores from the PHF 2017. The exogeneity assumption is that having correctly answered the financial literacy questions in 2017 is uncorrelated to correctly guessing the answer in 2021 provided the measurement error is not autocorrelated across survey waves. While this cannot address all biases discussed, it can address the measurement error and endogeneity if decisions to increase financial literacy and to invest are made consecutively within this time window. However, one disadvantage of this IV approach is that it excludes 27% of the sample, since all respondents from the PHF 2021 who did not participate in the 2017 wave could not be included in this analysis.[27]

We present results from the first stage regression in Table A5. Overall, using financial literacy in previous survey waves is a strong instrument for current financial literacy. The second stage results are shown in Table 6, Columns 4 and 5. There is a strong and positive effect of financial literacy on stock market participation.[28] This is in line with results previously documented in the literature (see, e.g., van Rooij et al. 2011, Bucher-Koenen et al. 2021).

[27] The sample used for the 2SLS regressions is slightly smaller, since it is only based on the panel respondents. For this purpose, we present the OLS regressions for the reduced sample, which is used in the 2SLS analyses in Table 6, Columns 6-8.

[28] As a robustness check, we rerun the analyses of Table 6 with the unweighted sample. The results become even stronger as the unweighted sample includes over-proportionally wealthier and better-educated participants. The results are shown in Table A6.

4.2. Financial fragility (Making ends meet)

We measure financial fragility based on the following question: "*When you think about the total monthly income of your household – how would you say your household makes ends meet? With great difficulty; With some difficulty; Fairly easily; Easily; Do not know; Refuse to answer*". Overall, the majority of the sample is not financially fragile: 44.5% (34.9%) of respondents considered making end meet easy (or fairly easy). 16.5% have some difficulties and only 4% have great difficulties making ends meet with their monthly household income (see Table 5, Panel B).

The results for financial fragility across financial literacy questions are depicted in Table 5, Panel B. We can see that with increasing difficulty to make ends meet, the share of correct answers to the financial literacy questions decreases significantly. For example, 85.5% of respondents whose households can easily make ends meet were able to answer the interest question correctly. In contrast, only 70.3% of respondents whose households can make ends meet only with great difficulty were able to answer correctly. This holds true for each question individually as well as for the overall assessment. While 65.7% of those households that can make ends meet (fairly) easily were able to answer the Big Three questions correctly, the share of households that was able to do so among those that make ends meet with some or great difficulty was significantly smaller at 45.9% ($t=4.04$, $p<0.001$). Moreover, the share of "do not know" responses rises with increasing difficulty to make ends meet.

[Table 7 about here]

Next, we look at the relationship between financial fragility and financial literacy in a multivariate regression. The dependent variable is a dummy equal to 1 if the "make ends meet" question is answered with "with great difficulty" or "with some difficulty", and 0 if the answer is "fairly easy" or "easy". Table 7 shows the results and is structured analogously to Table 6.

In Column 1, we examine the three financial literacy questions separately to determine which aspect of financial knowledge is most indicative of financial fragility. Interestingly, we find that participants who were able to answer either the interest or risk question correctly are less financially fragile; that is, they are better able to make ends meet. The reverse holds true for inflation knowledge. Here, participants who were able to answer the inflation question correctly experience more difficulties making ends meet. This could indicate some degree of reverse causality. Individuals who experience difficulties making ends meet could be aware of the increase in prices for specific goods they need to buy. They are hurt more by inflation and thus are more sensitive. The assumption that financial hardship leads to awareness and understanding of inflation is consistent with findings from Easterly and Fischer (2001), who show that the poor are more likely than the rich to mention inflation as a top

national concern. Ehrmann and Tzamourani (2012) also show that lower income groups are more likely to mention fighting inflation as a policy priority.

With regard to the socio-demographic controls, we find that households with children are more financially fragile compared to households without children. Older respondents (>65 years) are less likely to be financially fragile than those aged 36-50. There is no gender difference and no difference between respondents in former East and West Germany. Compared to employed persons, retired individuals are more likely to indicate a struggle to make ends meet. The results for education and marital status are inconclusive, while the results concerning income are as expected. Households in the 4th and 5th income quintile are less likely to be financially fragile compared to those in the 3rd quintile. The reverse holds true for those in the 1st and 2nd income quintiles; that is, they experience more difficulties making ends meet.

Analogous to Section 4.1, we address potential concerns caused by measurement error and endogeneity by implementing an IV strategy. As before, we use the answers that respondents gave in the PHF wave of 2017 as an instrument for financial literacy in 2021. The IV results are shown in Table 7, Columns 4 and 5.[29] Participants who were able to answer all Big Three financial literacy questions correctly are shown to be less financially fragile (Column 4). The same holds true when measuring financial literacy by the number of correct answers (Column 5).[30]

5. Summary and Conclusions

Drawing on data from the most recent 2021 wave of the Panel on Household Finance (PHF) collected by the Deutsche Bundesbank, we analyze the relationship between financial literacy and two key indicators of financial well-being: stock market participation and the ability of households to cover their expenses in a typical month. Overall, around 62% of households in Germany could answer the Big Three financial literacy questions correctly. While this is comparably high internationally, financial literacy is not universal: there is substantial heterogeneity between groups. Financial literacy is significantly lower among individuals with lower education, lower income, women, and those living in former East Germany. Finally, we conclude that financial literacy matters for financial well-being: those with a higher degree of financial literacy are more likely to participate in the stock market and less likely to report financial difficulties.

[29] As a robustness check, we repeat the OLS regression from the full sample (Columns 1-3) with the reduced sample used in the 2SLS analyses. Table 7, Columns 6-8 show that the results are robust to the smaller sample. However, due to the smaller sample size the effect of inflation on making ends meet is no longer statistically significant.

[30] Again, we rerun the analyses of Table 7 with the unweighted sample. The results become even stronger as the unweighted sample includes over proportionally wealthier and better-educated participants. The results are shown in Table A7.

Currently, Germany does not have a national financial education strategy in place. However, discussions on the development of a strategy in cooperation with OECD experts are ongoing. In light of the lower levels of financial literacy among specific sub-groups of the population documented in this paper, one focus of a national strategy should be on the development of financial education programs for these vulnerable groups along with specific strategies for how to reach them. Implementing financial education in schools has the advantage of reaching almost everyone at an early stage. In addition, it remains important to continue to collect and analyze data on a regular basis regarding financial literacy of the general population and its specific sub-groups in order to monitor and adjust any existing strategies.

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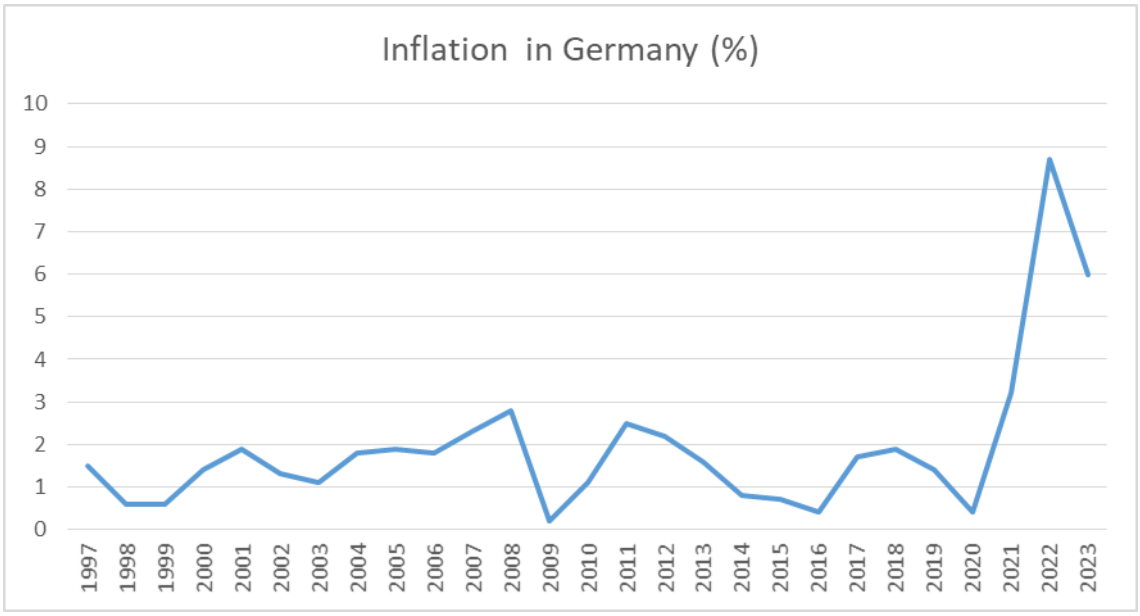
Figures

Figure 1: Development of inflation in Germany



Inflation in Germany, 1997-2023. Harmonized index of consumer prices, annual percentage change.
Source: Federal Statistical Office and Eurostat.

Tables

Table 1: Summary statistics for the Big Three financial literacy questions (PHF 2021)

	Full sample		Ages 25-65	
	No.	%	No.	%
Panel A: Interest (N=4,116)				
More than 102 Euro	3,333	81.0	2,016	83.6
Exactly 102 Euro	349	8.5	185	7.7
Less than 102 Euro	298	7.2	140	5.8
Do not know	74	1.8	38	1.6
Refuse to answer	62	1.5	31	1.3
Panel B: Inflation (N=4,116)				
More	62	1.5	42	1.7
Exactly the same	254	6.2	156	6.5
Less	3,634	88.3	2,128	88.3
Do not know	99	2.4	54	2.2
Refuse to answer	67	1.6	30	1.3
Panel C: Risk (N=2,036)				
'True' - incorrect	260	12.8	154	12.8
'False' - correct	1,570	77.1	946	78.8
Do not know	164	8.1	81	6.8
Refuse to answer	42	2.1	20	1.7
Panel D: Answers across all three questions				
Correct answers to interest and inflation (N=4,116)	3,073	74.7	1,850	76.8
Big Three correct (N=2,036)	1,259	61.8	787	65.5
None of the Big Three correct (N=2,036)	49	2.4	31	2.5
At least one 'do not know' (N=2,036)	195	9.6	101	8.4
All 'do not know' (N=2,036)	18	0.9	9	0.8

Notes: Total sample: 4,116 observations, age 25-65: 2,410 observations. 2,036 observations of the sample received the risk question (age 25-65: N=1,201). The data is weighted.
Source: Authors' calculations on the basis of the PHF 2021.

Table 2: Financial literacy and socio-demographic variables (in percent)

This table shows financial literacy across different socio-demographic variables. Columns 1-6 show the percentages of correct answers and "do not know" (DK) responses to each financial literacy question (interest, inflation, original risk). Columns 7-8 contain the overall performance on the Big Three financial literacy questions, i.e., the percentage of respondents with three correct answers and the percentage with at least one "do not know" response. The data is weighted.

	Interest		Inflation		Risk		Big Three	
	Correct	DK	Correct	DK	Correct	DK	Correct	DK
Total	81.0	1.8	88.3	2.4	77.1	8.1	61.8	9.6
Age								
18-35	90.2	1.0	87.4	3.7	79.6	5.4	63.9	6.4
36-50	84.1	2.2	85.6	2.6	79.1	7.0	68.3	8.7
51-65	80.3	1.2	91.0	1.4	79.2	6.8	64.6	8.8
>65	72.5	2.6	88.5	2.3	71.1	12.4	51.5	13.4
Sex								
Male	85.0	1.3	90.3	1.8	80.4	5.6	67.9	6.2
Female	76.4	2.3	86.0	3.0	73.3	10.9	54.8	13.5
Education (ISCED 1997 classification)								
Lower secondary education or less	65.8	6.8	68.8	8.2	60.2	17.3	37.2	21.4
Upper-level secondary school	95.8	0.8	89.2	3.2	80.7	3.1	69.7	3.1
Post-secondary non-tertiary education	78.3	1.4	90.0	1.8	75.4	8.9	58.3	10.6
Tertiary education	90.4	1.0	91.5	1.6	85.7	3.8	76.2	4.3
Employment status								
Employed for wage/salary	85.1	1.3	90.0	2.1	81.4	4.6	68.3	5.5
Self-employed	91.3	0.0	89.3	0.0	74.2	5.1	68.4	5.1
Not employed	84.8	1.3	79.6	5.2	71.7	15.4	60.6	20.4
Retired	70.9	3.0	87.7	2.6	71.7	12.8	49.4	14.7
Number of observations	4,116	4,116	4,116	4,116	2,036	2,036	2,036	2,036

Source: Authors' calculations on the basis of the PHF 2021.

Table 3: Financial literacy in East and West Germany (in %)

This table displays the share of households who correctly answer the interest, inflation, and original risk diversification questions in former East and West Germany, respectively, in columns 1-6. Columns 7 and 8 show the percentage of participants with three correct answers in former East and West Germany. The data is weighted.

	Interest		Inflation		Risk		All Big Three correct	
	West	East	West	East	West	East	West	East
Total	81.3	80.9	90.5	86.3	78.8	70.3	63.5	55.2
Age								
18-35	89.9	91.8	87.7	85.8	81.7	71.9	66.0	56.1
36-50	84.3	83.4	87.9	76.9	79.4	77.6	67.8	70.9
51-65	81.6	74.9	90.2	94.6	79.8	76.4	65.6	59.8
>65	72.3	73.2	89.4	85.5	74.9	59.1	54.9	40.7
Sex								
Male	84.7	86.1	90.9	88.1	81.4	75.7	68.8	63.9
Female	77.5	72.3	86.7	83.7	75.6	65.5	56.9	47.5
Education (ISCED 1997 classification)								
Lower secondary education or less	65.3	67.7	68.0	71.9	59.7	62.0	37.3	37.1
Upper-level secondary school	96.2	91.6	90.6	73.8	83.0	63.6	76.7	17.0
Post-secondary non-tertiary education	78.6	77.2	90.7	87.5	78.7	62.5	60.1	51.1
Tertiary education	91.0	88.1	92.2	88.7	84.6	89.9	77.0	72.9
Employment status								
Employed for wage/salary	85.1	85.1	91.3	84.9	82.4	76.9	69.0	65.6
Self-employed	94.0	82.7	87.3	96.0	72.4	81.9	66.2	78.0
Not employed	85.2	82.9	78.7	84.6	73.8	59.9	66.0	30.8
Retired	71.2	69.9	88.3	85.6	75.1	60.8	52.0	41.0
Number of observations	3,284	832	3,284	832	1,633	403	1,633	403

Source: Authors' calculations on the basis of the PHF 2021.

Table 4: Financial literacy and inflation

This table shows linear regression (OLS) of inflation literacy on socio-demographic characteristics. Dependent variable: "Inflation literacy", i.e., dummy equal to 1 if respondents answered the inflation question correctly, 0 otherwise. The regressions are weighted. Replicate weights and Rubin's rule were used to adjust standard errors for the weighting procedure and imputations, respectively. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Variables	(1)	(2)	(3)
Reference category: Age 36-50			
Age 18-35	0.030	0.029	0.047
	(0.031)	(0.031)	(0.037)
Age 51-65	0.065**	0.064**	0.061**
	(0.026)	(0.025)	(0.025)
Age >65	0.091**	0.091**	0.087**
	(0.036)	(0.036)	(0.035)
Female	-0.029*	-0.029*	-0.027
	(0.016)	(0.016)	(0.016)
Reference category: Employed (HH head)			
Self-employed	-0.032	-0.031	-0.035
	(0.040)	(0.040)	(0.040)
Not employed	-0.067*	-0.067*	-0.065*
	(0.040)	(0.040)	(0.039)
Retired	-0.058*	-0.057*	-0.056*
	(0.030)	(0.030)	(0.031)
Reference category: Education (ISCED 1997 classification) = Post-secondary non-tertiary education			
Lower secondary education or less	-0.195***	-0.195***	-0.195***
	(0.046)	(0.046)	(0.046)
Upper-level secondary school	0.019	0.016	0.023
	(0.051)	(0.051)	(0.052)
Tertiary education	0.017	0.017	0.016
	(0.016)	(0.016)	(0.016)
Reference category: West (Current residency)			
East		-0.027	0.013
		(0.022)	(0.027)
Reference category: Country of residence in 1989 = West Germany			
Country of residence in 1989 = East Germany			-0.062**
			(0.028)
Country of residence in 1989 = another country			-0.013
			(0.037)
Country of residence in 1989 = born after 1989			-0.043
			(0.045)
Constant	0.887***	0.893***	0.900***
	(0.025)	(0.024)	(0.024)
Observations	4,112	4,112	4,105

Table 5: Financial literacy and financial behavior

This table shows descriptive results for financial behaviors and correlations with financial literacy. Panel A shows the percentage of households currently invested in the stock market. Panel B shows the self-reported degree to which households can make ends meet financially in a typical month. Responses are weighted. The data is weighted.

	Panel A: Investments in stocks (in %)		Panel B: Make ends meet (in %)			
	No	Yes	With great difficulty	With some difficulties	Fairly easily	Easily
Total	76.9	23.1	4.0	16.5	34.9	44.5
Interest (N=4,116)						
Correct	78.6	88.8	70.3	74	79.8	85.5
Do not know	2.3	0.2	7.5	2.9	1.9	0.8
Inflation (N=4,116)						
Correct	86.1	95.6	74.8	87.5	86.1	91.5
Do not know	3.0	0.3	0.1	3.0	3.4	0.7
Risk (N=2,036)						
Correct	73.6	88.6	59.5	61.8	78.2	83.1
Do not know	10.5	0.1	7.1	15.7	8.0	5.3
Overall						
Interest and inflation correct *(N=4,116)*	71.2	86.4	56.2	68.0	73.4	79.8
All Big Three correct *(N=2,036)*	57.4	76.5	53.9	44.5	60.9	69.7
At least one DK among Big Three *(N=2,036)*	12.4	0.2	7.19	17.3	10.6	6.0

Source: Authors' calculations on the basis of the PHF 2021.

Table 6: Stock market participation

The dependent variable for all regressions is a dummy variable indicating if a household participates in the stock market. This table contains OLS and 2SLS regressions (in columns 4 and 5) in which financial literacy is instrumented for. Columns 1-3 depict results for the full sample size of N=4,112. Columns 4-8 show a reduced sample size (N=3,037) due to 2SLS approach applied. The sample size is smaller because individuals needed to have been observed in both survey waves. The regressions are weighted. Replicate weights and Rubin's rule were used to adjust standard errors for the weighting procedure and imputations, respectively. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Variables	(1) OLS	(2) OLS	(3) OLS	(4) 2SLS	(5) 2SLS	(6) OLS	(7) OLS	(8) OLS
Financial literacy: Compound Interest	-0.006					-0.014		
	(0.020)					(0.026)		
Financial literacy: Inflation	0.062***					0.065**		
	(0.023)					(0.029)		
Financial Literacy: Risk	0.030					0.021		
	(0.021)					(0.024)		
Big Three correct		0.031*		0.261**			0.015	
		(0.018)		(0.116)			(0.022)	
Number of Big Three correct			0.026***		0.117**			0.021*
			(0.009)		(0.056)			(0.011)
Reference category: Number of children = no children								
1 child	-0.030	-0.031	-0.031	0.006	0.005	0.003	0.003	0.003
	(0.032)	(0.032)	(0.032)	(0.041)	(0.039)	(0.039)	(0.039)	(0.039)
2 children	0.003	0.001	0.002	0.004	0.004	0.007	0.007	0.007
	(0.035)	(0.036)	(0.035)	(0.043)	(0.042)	(0.042)	(0.042)	(0.042)
3 or more children	-0.095**	-0.099**	-0.097**	-0.069	-0.072	-0.089**	-0.094**	-0.092**
	(0.038)	(0.040)	(0.039)	(0.050)	(0.046)	(0.045)	(0.047)	(0.046)
Reference category: Age = 36-50 years								
18-35 years	-0.038	-0.035	-0.039	-0.071	-0.083*	-0.074*	-0.073*	-0.074*
	(0.034)	(0.034)	(0.034)	(0.046)	(0.045)	(0.043)	(0.043)	(0.043)
51-65 years	0.040	0.043	0.042	0.019	0.018	0.025	0.028	0.027
	(0.028)	(0.028)	(0.028)	(0.035)	(0.034)	(0.033)	(0.033)	(0.033)
>65 years	0.100***	0.100***	0.101***	0.078*	0.090**	0.096**	0.097**	0.097**
	(0.036)	(0.036)	(0.036)	(0.046)	(0.044)	(0.043)	(0.043)	(0.043)

Female	-0.008	-0.008	-0.007	-0.013	-0.016	-0.027	-0.028	-0.026
	(0.019)	(0.019)	(0.019)	(0.024)	(0.023)	(0.022)	(0.023)	(0.023)
Reference category: Employment status = Employed and earning wage or salary (HH head)								
Self-employed	-0.011	-0.013	-0.014	-0.016	-0.028	-0.024	-0.027	-0.028
	(0.042)	(0.042)	(0.042)	(0.051)	(0.046)	(0.044)	(0.045)	(0.045)
Not employed	-0.010	-0.014	-0.014	-0.001	-0.003	-0.012	-0.017	-0.015
	(0.032)	(0.032)	(0.032)	(0.043)	(0.041)	(0.040)	(0.040)	(0.040)
Retired	-0.021	-0.018	-0.019	-0.004	-0.022	-0.034	-0.031	-0.031
	(0.027)	(0.027)	(0.027)	(0.037)	(0.033)	(0.031)	(0.031)	(0.031)
Reference category: Education (ISCED 1997 classification) = Post-secondary non-tertiary education								
Lower secondary education or less	-0.025	-0.035	-0.030	-0.014	-0.009	-0.042	-0.049*	-0.044
	(0.022)	(0.023)	(0.022)	(0.038)	(0.037)	(0.028)	(0.029)	(0.029)
Upper-level secondary school	-0.036	-0.037	-0.039	-0.055	-0.043	-0.015	-0.019	-0.021
	(0.061)	(0.061)	(0.061)	(0.101)	(0.095)	(0.090)	(0.090)	(0.090)
Tertiary education	0.078***	0.077***	0.077***	0.052	0.069**	0.090***	0.091***	0.089***
	(0.025)	(0.025)	(0.025)	(0.037)	(0.033)	(0.030)	(0.029)	(0.029)
Reference category: Marital status = Single								
Married	-0.043	-0.041	-0.042	-0.025	-0.036	-0.040	-0.037	-0.038
	(0.031)	(0.031)	(0.031)	(0.039)	(0.038)	(0.037)	(0.037)	(0.037)
Divorced	-0.068**	-0.069**	-0.068**	-0.046	-0.047	-0.051	-0.050	-0.050
	(0.033)	(0.033)	(0.033)	(0.041)	(0.040)	(0.038)	(0.038)	(0.038)
Widowed	-0.063*	-0.061*	-0.061*	-0.020	-0.034	-0.043	-0.042	-0.042
	(0.037)	(0.037)	(0.037)	(0.051)	(0.048)	(0.045)	(0.045)	(0.045)
Separated	0.017	0.019	0.019	-0.017	-0.004	0.004	0.006	0.005
	(0.046)	(0.047)	(0.046)	(0.076)	(0.068)	(0.061)	(0.062)	(0.062)
With partner	0.022	0.021	0.023	-0.029	-0.007	-0.010	-0.010	-0.009
	(0.038)	(0.038)	(0.038)	(0.056)	(0.054)	(0.050)	(0.049)	(0.049)
East dummy (Current residency)	-0.025	-0.026	-0.026	-0.012	-0.015	-0.015	-0.015	-0.015
	(0.020)	(0.021)	(0.021)	(0.027)	(0.026)	(0.026)	(0.026)	(0.026)
Reference category: Household's willingness to take on financial risks = Below average risk affinity								
Above average risk affinity	0.240***	0.243***	0.243***	0.307***	0.302***	0.301***	0.305***	0.305***
	(0.058)	(0.058)	(0.058)	(0.061)	(0.062)	(0.062)	(0.062)	(0.062)
Not willing to take on any risk	-0.328***	-0.328***	-0.327***	-0.309***	-0.320***	-0.339***	-0.340***	-0.338***
	(0.022)	(0.022)	(0.022)	(0.033)	(0.031)	(0.028)	(0.028)	(0.028)

Reference category: Net income quintile = 3rd quintile								
1st quintile	-0.046	-0.048	-0.044	-0.037	-0.021	-0.043	-0.042	-0.039
	(0.033)	(0.033)	(0.033)	(0.045)	(0.044)	(0.042)	(0.043)	(0.043)
2nd quintile	-0.009	-0.011	-0.010	-0.036	-0.023	-0.026	-0.026	-0.025
	(0.029)	(0.029)	(0.029)	(0.036)	(0.033)	(0.033)	(0.032)	(0.033)
4th quintile	0.073***	0.073***	0.073***	0.042	0.058*	0.069**	0.069**	0.068**
	(0.028)	(0.028)	(0.028)	(0.036)	(0.034)	(0.032)	(0.032)	(0.032)
5th quintile	0.153***	0.153***	0.154***	0.073*	0.095**	0.104***	0.103***	0.103***
	(0.030)	(0.030)	(0.030)	(0.039)	(0.037)	(0.036)	(0.036)	(0.036)
Treatment: modified risk question	0.019	0.015	0.017	0.076**	0.060**	0.033	0.028	0.031
	(0.018)	(0.017)	(0.017)	(0.032)	(0.028)	(0.022)	(0.022)	(0.021)
Constant	0.300***	0.355***	0.307***	0.219**	0.094	0.333***	0.387***	0.344***
	(0.049)	(0.046)	(0.050)	(0.094)	(0.153)	(0.059)	(0.054)	(0.060)
Observations	4,112	4,112	4,112	3,037	3,037	3,037	3,037	3,037

Table 7: Financial fragility (Making ends meet)

The dependent variable for all regressions is a dummy variable indicating if a household can make ends meet “with great difficulty" or "with some difficulty" and zero of if they can make ends meet "fairly easily" or "easily". This table contains OLS and 2SLS regressions (in columns 4 and 5) in which financial literacy is instrumented for. Columns 1-3 depict results for the full sample size of N=4,112. Columns 4-8 show a reduced sample size (N=3,037) due to 2SLS approach applied. The sample size is smaller because individuals needed to have been observed in both survey waves. The regressions are weighted. Replicate weights and Rubin’s rule were used to adjust standard errors for the weighting procedure and imputations, respectively. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Variables	(1) OLS	(2) OLS	(3) OLS	(4) 2SLS	(5) 2SLS	(6) OLS	(7) OLS	(8) OLS
Financial literacy: Compound Interest	-0.045*					-0.060*		
	(0.027)					(0.032)		
Financial literacy: Inflation	0.062*					0.059		
	(0.034)					(0.041)		
Financial Literacy: Risk	-0.070***					-0.070***		
	(0.024)					(0.027)		
Big Three correct		-0.047**		-0.276**			-0.053**	
		(0.020)		(0.128)			(0.025)	
Number of Big Three correct			-0.029**		-0.175**			-0.035**
			(0.012)		(0.077)			(0.015)
Reference category: Number of children = no children								
1 child	0.094**	0.093**	0.093**	0.124**	0.124**	0.131**	0.130**	0.129**
	(0.043)	(0.043)	(0.043)	(0.052)	(0.053)	(0.052)	(0.052)	(0.052)
2 children	0.118***	0.117***	0.116**	0.093*	0.094*	0.093*	0.092*	0.092*
	(0.044)	(0.045)	(0.045)	(0.056)	(0.056)	(0.053)	(0.053)	(0.053)
3 or more children	0.162**	0.162**	0.161**	0.189**	0.181*	0.215**	0.216**	0.214**
	(0.078)	(0.079)	(0.080)	(0.092)	(0.100)	(0.093)	(0.093)	(0.095)
Reference category: Age = 36-50 years								
18-35 years	0.031	0.028	0.032	0.105**	0.123**	0.106**	0.105**	0.108**
	(0.036)	(0.037)	(0.037)	(0.052)	(0.054)	(0.050)	(0.051)	(0.051)
51-65 years	-0.034	-0.030	-0.030	-0.011	-0.006	-0.020	-0.017	-0.016
	(0.030)	(0.030)	(0.030)	(0.037)	(0.037)	(0.035)	(0.035)	(0.035)

>65 years	-0.228***	-0.218***	-0.220***	-0.175***	-0.185***	-0.200***	-0.192***	-0.194***
	(0.050)	(0.050)	(0.050)	(0.059)	(0.058)	(0.056)	(0.056)	(0.056)
Female	-0.017	-0.015	-0.015	-0.041	-0.043	-0.026	-0.026	-0.026
	(0.022)	(0.022)	(0.022)	(0.027)	(0.026)	(0.026)	(0.026)	(0.026)
Reference category: Employment status = Employed and earning wage or salary								
Self-employed	0.098**	0.093**	0.095**	0.050	0.064	0.066	0.059	0.062
	(0.041)	(0.041)	(0.041)	(0.050)	(0.049)	(0.045)	(0.046)	(0.046)
Not employed	0.103**	0.099**	0.100**	0.037	0.033	0.054	0.053	0.052
	(0.043)	(0.044)	(0.043)	(0.061)	(0.062)	(0.055)	(0.055)	(0.055)
Retired	0.142***	0.135***	0.137***	0.091	0.105*	0.123**	0.119**	0.122**
	(0.044)	(0.043)	(0.043)	(0.055)	(0.055)	(0.053)	(0.052)	(0.052)
Reference category: Education (ISCED 1997 classification) = Post-secondary non-tertiary education								
Lower secondary education or less	0.150***	0.141***	0.137**	0.127*	0.103	0.163***	0.161**	0.156**
	(0.053)	(0.054)	(0.054)	(0.065)	(0.068)	(0.063)	(0.064)	(0.064)
Upper-level secondary school	-0.170***	-0.177***	-0.177***	0.015	0.013	-0.012	-0.023	-0.023
	(0.064)	(0.065)	(0.065)	(0.096)	(0.090)	(0.087)	(0.089)	(0.089)
Tertiary education	-0.059***	-0.065***	-0.066***	-0.013	-0.019	-0.049**	-0.053**	-0.053**
	(0.021)	(0.020)	(0.021)	(0.030)	(0.030)	(0.025)	(0.024)	(0.025)
Reference category: Marital status = Single								
Married	0.104***	0.108***	0.110***	0.119***	0.130***	0.129***	0.135***	0.137***
	(0.032)	(0.033)	(0.033)	(0.042)	-0.041	(0.038)	(0.038)	(0.038)
Divorced	0.087**	0.089**	0.089**	0.095*	0.095*	0.102**	0.105**	0.105**
	(0.038)	(0.038)	(0.038)	(0.051)	(0.051)	(0.047)	(0.047)	(0.047)
Widowed	-0.078**	-0.074*	-0.073*	-0.086*	-0.076*	-0.068	-0.066	-0.064
	(0.039)	(0.038)	(0.039)	(0.046)	(0.045)	(0.044)	(0.044)	(0.044)
Separated	0.100	0.106	0.105	0.182**	0.174**	0.159*	0.164*	0.163*
	(0.067)	(0.070)	(0.070)	(0.091)	(0.088)	(0.090)	(0.094)	(0.094)
With partner	0.181***	0.180***	0.177***	0.148**	0.125*	0.135**	0.136**	0.132**
	(0.056)	(0.057)	(0.057)	(0.068)	(0.068)	(0.062)	(0.063)	(0.062)

Reference category: East vs. West Germany = 0, West (Current residency)								
East vs. West Germany = East	0.009	0.008	0.008	-0.008	-0.006	-0.003	-0.003	-0.002
	(0.024)	(0.025)	(0.025)	(0.030)	(0.031)	(0.029)	(0.030)	(0.030)
Reference category: Net income quintile = 3rd quintile								
1st quintile	0.247***	0.254***	0.250***	0.219***	0.192***	0.217***	0.226***	0.220***
	(0.040)	(0.040)	(0.040)	(0.053)	(0.057)	(0.050)	(0.050)	(0.050)
2nd quintile	0.086***	0.088***	0.087***	0.111***	0.095**	0.103***	0.106***	0.103***
	(0.033)	(0.033)	(0.033)	(0.039)	(0.041)	(0.039)	(0.040)	(0.040)
4th quintile	-0.088***	-0.089***	-0.091***	-0.073*	-0.084**	-0.095**	-0.098**	-0.100**
	(0.032)	(0.032)	(0.032)	(0.041)	(0.039)	(0.039)	(0.039)	(0.039)
5th quintile	-0.188***	-0.190***	-0.192***	4	-0.186***	-0.198***	-0.200***	-0.204***
	(0.030)	(0.031)	(0.031)	(0.040)	(0.036)	(0.036)	(0.037)	(0.037)
Treatment: new risk question	-0.013	-0.005	-0.005	-0.059	-0.057	-0.022	-0.015	-0.015
	(0.021)	(0.020)	(0.020)	(0.036)	(0.036)	(0.025)	(0.024)	(0.024)
Constant	0.169***	0.161***	0.204***	0.283***	0.554***	0.162**	0.141***	0.196***
	(0.052)	(0.040)	(0.050)	(0.098)	(0.208)	(0.065)	(0.048)	(0.063)
Observations	4,112	4,112	4,112	3,037	3,037	3,037	3,037	3,037

Appendix

A. The data

The 'Panel on Household Finances (PHF) is a representative survey of private households living in Germany[31] focused on measuring household finances. It covers balance sheet, pension, income, work life and other demographic characteristics of households and their members, as well as attitude questions related to financial behavior and questions on financial literacy. It is conducted by the Deutsche Bundesbank with an intended frequency of three years. The first three waves took place in 2010-2011, 2014, 2017 respectively. The fourth wave had to be postponed from 2020 to 2021 because of the COVID-19 pandemic (with some interviews extending to early 2022). In the first three years, almost all interviews were conducted with Computer Assisted Personal Interviewing (CAPI), however, because of the restrictions related to the COVID-19 pandemic, most of the interviews in the 2021 wave were conducted by phone (Computer Assisted Telephone Interviewing - CATI).[32]

The PHF employs a complex survey design with an oversampling of the wealthy in the first three waves and a more moderate oversampling of residents of former East Germany in the fourth wave.[33] Survey weights are provided in order to adjust for the unequal selection probabilities as well as for panel attrition and non-response. Weights are calibrated so that key sample statistics match known population totals. Furthermore, the PHF also provides a set of 1,000 replication weights that allow the survey design to be accounted for in the computation of standard errors. Similar to the Survey of Consumer Finances, missing responses in the PHF are multiply imputed using a complex imputation algorithm.[34] Therefore, standard errors in regressions need to be adjusted using Rubin's rule. We use weights when providing descriptive statistics and regression estimations.[35] We adjust standard errors for imputation error and survey design by bootstrapping from the replicate weights.

[31] Persons living in institutions are excluded from the survey.

[32] The telephone interviews are also referred to as "CAPI by phone", since in most cases the interviewers who were assigned for face-to-face interviews were used. See, Deutsche Bundesbank (2023) and the PHF Methods Report 4. Wave 2021 (Knerr et al. 2022), chapter 3 for information on the most recent data collection

[33] Wealthy regions are still overrepresented in the (unweighted) sample because of the panel component.

[34] Note that there are no missing answers in the financial literacy questions because missing answers were coded explicitly as "do not know" or "no response".

[35] We also conduct unweighted regressions as robustness checks and show that the weights do not drive the conclusions drawn from the analyses.

B. Additional Tables

Table A1: Summary statistics

	Full sample (N=4,116)		Restricted sample (N=2,036)	
Variable	N	%	N	%
Age				
18-35	780	18.96	377	18.51
36-59	993	24.12	476	23.39
51-65	1,209	29.37	641	31.49
>65	1,134	27.55	542	26.61
Sex				
Female	1,924	46.74	943	46.32
Labor market status				
Employed for wage/salary	2,176	52.87	1,104	54.21
Self-employed	259	6.29	133	6.55
Not employed	372	9.03	170	8.35
Retired	1,309	31.81	629	30.88
Education (ISCED 1997 classification)				
Lower secondary education or less	394	9.58	186	9.14
Upper-level secondary school	135	3.28	74	3.64
Post-secondary non-tertiary education	2,447	59.51	1,194	58.69
Tertiary education	1,136	27.62	580	28.53
Number of children in household (<18 years)				
None	3,278	79.64	1,593	78.24
1	405	9.84	214	10.49
2	313	7.61	175	8.59
3 or more	120	2.91	55	2.68
Marital status				
Married	1,760	42.76	883	43.39
Single	1,037	25.19	484	23.79
Divorced	549	13.34	289	14.18
Widowed	437	10.63	210	10.32
Separated	122	2.95	69	3.37
With partner	211	5.12	101	4.95
Residence in former East or West Germany				
East	856	20.79	410	20.16
Country of residence in 1989				
West Germany	2,542	61.87	1,282	63.04
East Germany	669	16.29	310	15.24
Another country	374	9.11	186	9.17
Born after 1989	523	12.73	255	12.55
Investments in stocks				
Yes	951	23.11	476	23.37
Make ends meet				
With great difficulty	166	4.04	59	2.89
With some difficulties	678	16.47	340	16.71
Fairly easily	1,438	34.94	735	36.08

Easily	1,833	44.54	902	44.31
Household's willingness to take on financial risks				
Above-average risk affinity	219	5.33	116	5.68
Average risk aversion	1,485	36.07	740	36.35
Not willing to take on any risk	2,412	58.59	1,180	57.97
Treatment: Modified risk question				
Yes	2,140	52.00	2,036	100.00

Total sample: 4,116 observations. The restricted sample received only the traditional risk question: N=2,036. The data is imputed and weighted.
Source: Authors' calculations on the basis of the PHF 2021.

Table A2: Overview of financial literacy questions across PHF waves

This table depicts which financial literacy questions were asked in each of the PHF waves. In 2021, only about 50% of the sample received the risk question in the classic format. The second half of the sample received modified questions, which are not included here.

	PHF 2011	**PHF 2014**	**PHF 2017**	**PHF 2021**
Interest	X	X	X	X
Inflation	X	X	X	X
Risk	X	X	X	X (50% sample)

Table A3: Financial literacy across time (PHF)

This table shows the Big Three financial literacy questions across the four waves of the PHF data set. Panel A shows the results for all participants in the respective waves. Panel B restricts the sample to a balanced panel. In total, N=549 respondents participated in all four waves. The data is weighted.

	Panel A: Full sample (percent)				*Panel B: Balanced panel (percent)*			
	PHF 2011	PHF 2014	PHF 2017	PHF 2021	PHF 2011	PHF 2014	PHF 2017	PHF 2021
Interest								
Incorrect answer	14.0	10.1	11.9	15.7	13.0	8.5	7.5	19.2
Correct answer	82.3	85.9	83.2	81.0	86.7	88.9	87.6	76.8
Do not know	2.7	2.7	3.0	1.8	0.3	1.8	3.6	0.7
Refuse to answer	1.0	1.4	1.9	1.5	0.0	0.8	1.3	3.3
Inflation								
Incorrect answer	8.6	7.8	8.0	7.7	7.0	6.8	5.0	8.1
Correct answer	87.4	87.7	86.3	88.3	92.7	90.6	91.2	87.9
Do not know	2.6	3.1	3.4	2.4	0.4	1.8	1.6	0.7
Refuse to answer	1.4	1.4	2.3	1.6	0.0	0.8	2.3	3.3
Risk								
Incorrect answer	15.1	12.3	13.4	12.8	15	13.9	10.1	12.9
Correct answer	70.1	70.8	70.7	77.1	79.3	76.7	78.8	81.4
Do not know	12.9	14.9	12.9	8.1	3.9	8.5	8.6	2.2
Refuse to answer	2.0	1.9	3.1	2.1	1.8	0.9	2.5	3.5
Overall								
All Big Three correct	59.0	61.6	60.5	61.8	70.0	68.1	69.5	65.1
At least one 'do not know' among Big Three	13.6	15.6	13.8	9.6	4.2	8.5	9.4	2.4
Number of observations:	3,564	4,459	4940	2036	549	549	549	549

Source: Authors' calculations on the basis of the PHF 2021.

Online Appendix to

Financial literacy, stock market participation, and financial well-being in Germany

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Table A4: Linear regression of Big Three on socio-demographic variables

This table depicts regressions of various financial literacy indicators on the treatment dummy and sociodemographic characteristics. The dependent variables are a dummy on whether the risk question was answered correctly regardless of whether the respondent received the traditional or the modified version (column 1), on whether the respondent replied "don't know" or "refuse to answer" to the risk question (column 2), on the number of Big Three question answered correctly (column 3), on whether the respondent answered all of the Big Three question correctly (column 4), and on whether the respondent answered the compound interest question (column 5), the inflation question (column 6) or the second compound interest question (column 7) correctly. The regressions are weighted. Replicate weights and Rubin's rule were used to adjust standard errors for the weighting procedure and imputations, respectively. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Variables	(1) All Big Three correct	(2) Number Big Three correct	(3) One DK in Big Three	(4) FL interest	(5) FL inflation	(6) FL risk	(7) FL interest DK	(8) FL inflation DK	(9) FL risk DK
Reference category: Age = 36-50 years									
18-35 years	-0.062	0.003	-0.025	0.052	0.029	-0.002	-0.011	0.007	-0.016
	(0.065)	(0.098)	(0.037)	(0.032)	(0.031)	(0.058)	(0.011)	(0.015)	(0.036)
51-65 years	-0.005	0.044	-0.011	-0.007	0.063**	0.008	-0.013	-0.013	-0.010
	(0.050)	(0.085)	(0.033)	(0.028)	(0.025)	(0.046)	(0.009)	(0.010)	(0.030)
>65 years	0.069	0.082	-0.070	0.049	0.090**	-0.040	-0.028	-0.019	-0.019
	(0.088)	(0.119)	(0.065)	(0.056)	(0.036)	(0.079)	(0.017)	(0.015)	(0.057)
Female	-0.109***	-0.180***	0.058***	-0.068***	-0.029*	-0.051	0.006	0.007	0.039**
	(0.037)	(0.057)	(0.021)	(0.020)	(0.016)	(0.032)	(0.007)	(0.009)	(0.020)
Reference category: Employment status = Employed and earning wage or salary									
Self-employed	-0.046	-0.009	0.015	0.039	-0.031	-0.091	-0.009*	-0.015***	0.018
	(0.072)	(0.094)	(0.052)	(0.035)	(0.040)	(0.074)	(0.005)	(0.005)	(0.053)
Not employed	-0.037	-0.099	0.145***	0.011	-0.066*	-0.075	-0.011	0.018	0.104**
	(0.060)	(0.123)	(0.051)	(0.039)	(0.040)	(0.058)	(0.012)	(0.027)	(0.046)
Retired	-0.230***	-0.248**	0.127**	-0.145***	-0.056*	-0.038	0.028*	0.013	0.079
	(0.079)	(0.101)	(0.056)	(0.049)	(0.030)	(0.067)	(0.017)	(0.013)	(0.049)
Reference category: Education (ISCED 1997 classification) = Post-secondary non-tertiary education									
Lower secondary education or less	-0.173**	-0.313**	0.074	-0.107**	-0.195***	-0.130*	0.053*	0.058*	0.058

	(0.085)	(0.147)	(0.054)	(0.047)	(0.046)	(0.072)	(0.028)	(0.031)	(0.051)
Upper-level secondary school	0.119	0.222*	-0.099**	0.119***	0.014	0.064	0.003	0.002	-0.073*
	(0.101)	(0.129)	(0.042)	(0.031)	(0.051)	(0.084)	(0.011)	(0.028)	(0.039)
Tertiary education	0.162***	0.229***	-0.052**	0.093***	0.017	0.100***	-0.002	-0.002	-0.044**
	(0.034)	(0.054)	(0.021)	(0.020)	(0.016)	(0.032)	(0.005)	(0.007)	(0.021)
Reference category: East vs. West Germany = West (Current residency)									
East	-0.061	-0.101	0.058*	-0.008	-0.027	-0.077*	0.013	0.018	0.045
	(0.044)	(0.070)	(0.030)	(0.028)	(0.022)	(0.040)	(0.011)	(0.013)	(0.029)
Constant	0.718***	2.588***	0.043	0.845***	0.903***	0.824***	0.011	0.012	0.040
	(0.051)	(0.092)	(0.029)	(0.031)	(0.026)	(0.040)	(0.007)	(0.009)	(0.027)
Observations	2,034	2,034	2,034	4,112	4,112	2,034	4,112	4,112	2,034

Table A5: First stage regression result

This table depicts the first-stage regressions of whether the respondent answered all of the Big Three question correctly (column 1) and the number of Big Three questions answered correctly (column 2) on the same respective variables from the previous wave in 2017, as well as various sociodemographic characteristics. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Variables	(1) Big Three correct	(2) Number of Big Three correct
All Big Three correct (2017)	0.214***	
	(0.035)	
Number of correct answers (among Big Three) (2017)		0.247***
		(0.042)
Reference category: Number of children = no children		
1 child	0.000	0.031
	(0.059)	(0.082)
2 children	0.035	0.060
	(0.064)	(0.106)
3 or more children	-0.076	-0.157
	(0.086)	(0.178)
Reference category: Age = 36-50 years		
18-35 years	0.004	0.097
	(0.055)	(0.090)
51-65 years	0.045	0.091
	(0.044)	(0.073)
>65 years	0.057	0.029
	(0.068)	(0.097)
Female	-0.045	-0.071
	(0.031)	(0.049)
Reference category: Employment status = Employed and earning wage or salary		
Self-employed	-0.047	-0.017
	(0.059)	(0.083)
Not employed	-0.076	-0.153
	(0.060)	(0.127)
Retired	-0.084	-0.054
	(0.060)	(0.088)
Reference category: Education (ISCED 1997 classification) = Post-secondary non-tertiary education		
Lower secondary education or less	-0.107**	-0.226**
	(0.051)	(0.104)
Upper-level secondary school	0.121	0.192
	(0.115)	(0.162)
Tertiary education	0.126***	0.158***
	(0.031)	(0.051)
Reference category: Marital status = Single		

Married	-0.044	-0.014
	(0.045)	(0.076)
Divorced	-0.003	-0.022
	(0.047)	(0.086)
Widowed	-0.078	-0.092
	(0.062)	(0.096)
Separated	0.087	0.075
	(0.104)	(0.153)
With partner	0.108	0.029
	(0.080)	(0.177)
East dummy (Current residency)	-0.003	-0.000
	(0.036)	(0.063)
Reference category: Household's willingness to take on financial risks = Below average risk affinity		
Above-average risk affinity	-0.012	0.019
	(0.063)	(0.089)
Not willing to take on any risk	-0.101***	-0.149**
	(0.034)	(0.060)
Reference category: Net income quintile = 3rd quintile		
1st quintile	-0.020	-0.154*
	(0.049)	(0.092)
2nd quintile	0.041	-0.016
	(0.046)	(0.075)
4th quintile	0.081*	0.043
	(0.042)	(0.068)
5th quintile	0.079*	0.011
	(0.043)	(0.071)
Treatment: new risk question	-0.197***	-0.305***
	(0.030)	(0.050)
Constant	0.532***	1.992***
	(0.063)	(0.153)
Observations	3,037	3,037

Table A6: Stock market participation (unweighted sample)

The dependent variable for all regressions is a dummy variable indicating if a household participates in the stock market. This table contains OLS and 2SLS regressions (in columns 4 and 5) in which financial literacy is instrumented for. Columns 1-3 depict results for the full sample size of N=4,112. Columns 4-8 show a reduced sample size (N=3,037) due to 2SLS approach applied. The sample size is smaller because individuals have to be observed in both survey waves. These regressions are not weighted. Rubin's rule was used to adjust standard errors for imputations. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Variables	(1) OLS	(2) OLS	(3) OLS	(4) 2SLS	(5) 2SLS	(6) OLS	(7) OLS	(8) OLS
Financial literacy: Compound Interest	0.035*					0.040*		
	(0.018)					(0.022)		
Financial literacy: Inflation	0.066***					0.065**		
	(0.024)					(0.029)		
Financial Literacy: Risk	0.030**					0.024		
	(0.015)					(0.017)		
Big Three correct		0.054***		0.272***			0.046***	
		(0.014)		(0.094)			(0.016)	
Number of Big Three correct			0.040***		0.133***			0.038***
			(0.009)		(0.044)			(0.010)
Reference category: Number of children = no children								
1 child	-0.043*	-0.045*	-0.044*	-0.025	-0.021	-0.018	-0.019	-0.019
	(0.025)	(0.025)	(0.025)	(0.032)	(0.031)	(0.031)	(0.031)	(0.031)
2 children	0.017	0.015	0.017	0.024	0.023	0.030	0.030	0.029
	(0.028)	(0.028)	(0.028)	(0.035)	(0.034)	(0.034)	(0.034)	(0.034)
3 or more children	-0.054	-0.056	-0.054	-0.036	-0.032	-0.045	-0.048	-0.045
	(0.042)	(0.042)	(0.042)	(0.050)	(0.050)	(0.049)	(0.049)	(0.049)
Reference category: Age = 36-50 years								
18-35 years	-0.029	-0.027	-0.030	-0.032	-0.044	-0.046	-0.045	-0.047
	(0.026)	(0.026)	(0.026)	(0.037)	(0.036)	(0.036)	(0.036)	(0.036)
51-65 years	0.048**	0.049**	0.048**	0.065**	0.061**	0.061**	0.062**	0.061**
	(0.021)	(0.021)	(0.021)	(0.026)	(0.026)	(0.025)	(0.025)	(0.025)

>65 years	0.091***	0.093***	0.093***	0.125***	0.122***	0.118***	0.120***	0.120***
	(0.032)	(0.032)	(0.031)	(0.038)	(0.037)	(0.037)	(0.037)	(0.037)
Female	-0.027**	-0.028**	-0.027**	-0.029	-0.031*	-0.042***	-0.044***	-0.043***
	(0.013)	(0.013)	(0.013)	(0.018)	(0.017)	(0.016)	(0.016)	(0.016)
Reference category: Employment status = Employed and earning wage or salary								
Self-employed	-0.037	-0.037	-0.038	-0.043	-0.046	-0.039	-0.038	-0.040
	(0.027)	(0.027)	(0.027)	(0.032)	(0.032)	(0.031)	(0.031)	(0.031)
Not employed	-0.028	-0.027	-0.028	-0.035	-0.035	-0.035	-0.035	-0.035
	(0.027)	(0.027)	(0.027)	(0.035)	(0.035)	(0.034)	(0.035)	(0.034)
Retired	-0.005	-0.006	-0.006	-0.003	-0.009	-0.016	-0.017	-0.016
	(0.026)	(0.026)	(0.026)	(0.031)	(0.030)	(0.030)	(0.030)	(0.030)
Reference category: Education (ISCED 1997 classification) = Post-secondary non-tertiary education								
Lower secondary education or less	-0.031	-0.037	-0.033	-0.021	-0.021	-0.041	-0.044	-0.041
	(0.032)	(0.032)	(0.032)	(0.041)	(0.040)	(0.039)	(0.039)	(0.039)
Upper-level secondary school	-0.028	-0.029	-0.029	-0.053	-0.033	-0.013	-0.015	-0.015
	(0.042)	(0.042)	(0.042)	(0.061)	(0.058)	(0.057)	(0.057)	(0.057)
Tertiary education	0.050***	0.050***	0.049***	0.015	0.027	0.045***	0.045***	0.044***
	(0.014)	(0.014)	(0.014)	(0.021)	(0.018)	(0.017)	(0.017)	(0.017)
Reference category: Marital status = Single								
Married	-0.014	-0.014	-0.014	0.001	-0.001	-0.006	-0.007	-0.006
	(0.023)	(0.023)	(0.023)	(0.029)	(0.028)	(0.028)	(0.028)	(0.028)
Divorced	-0.048*	-0.049*	-0.048*	-0.029	-0.030	-0.027	-0.026	-0.027
	(0.027)	(0.027)	(0.027)	(0.035)	(0.034)	(0.034)	(0.034)	(0.034)
Widowed	-0.021	-0.022	-0.021	-0.001	-0.007	-0.016	-0.017	-0.016
	(0.030)	(0.030)	(0.030)	(0.037)	(0.036)	(0.035)	(0.036)	(0.035)
Separated	-0.020	-0.022	-0.020	-0.050	-0.034	-0.036	-0.040	-0.037
	(0.045)	(0.045)	(0.045)	(0.060)	(0.059)	(0.059)	(0.059)	(0.059)
With partner	0.026	0.022	0.025	0.023	0.040	0.036	0.030	0.034
	(0.034)	(0.034)	(0.034)	(0.047)	(0.046)	(0.046)	(0.046)	(0.046)

East dummy (Current residency)	-0.046***	-0.047***	-0.047***	-0.032	-0.037*	-0.037*	-0.036*	-0.037*
	(0.016)	(0.016)	(0.016)	(0.020)	(0.019)	(0.019)	(0.019)	(0.019)
Reference category: Household's willingness to take on financial risks = Below average risk affinity								
Above-average risk affinity	0.201***	0.199***	0.200***	0.192***	0.198***	0.203***	0.202***	0.202***
	(0.027)	(0.027)	(0.027)	(0.033)	(0.032)	(0.032)	(0.032)	(0.032)
Not willing to take on any risk	-0.392***	-0.392***	-0.391***	-0.377***	-0.385***	-0.403***	-0.404***	-0.402***
	(0.014)	(0.014)	(0.014)	(0.020)	(0.018)	(0.016)	(0.016)	(0.016)
Reference category: Net income quintile = 3rd quintile								
1st quintile	-0.057**	-0.061**	-0.057**	-0.030	-0.017	-0.036	-0.042	-0.037
	(0.026)	(0.025)	(0.026)	(0.033)	(0.033)	(0.032)	(0.032)	(0.032)
2nd quintile	-0.035	-0.035	-0.034	-0.035	-0.032	-0.039	-0.041	-0.039
	(0.024)	(0.024)	(0.024)	(0.029)	(0.029)	(0.028)	(0.028)	(0.028)
4th quintile	0.056***	0.057***	0.057***	0.042*	0.044*	0.048**	0.049**	0.048**
	(0.020)	(0.020)	(0.020)	(0.025)	(0.024)	(0.024)	(0.024)	(0.024)
5th quintile	0.164***	0.165***	0.164***	0.129***	0.135***	0.144***	0.145***	0.144***
	(0.021)	(0.021)	(0.021)	(0.026)	(0.025)	(0.024)	(0.024)	(0.024)
Treatment: new risk question	0.014	0.016	0.017	0.066***	0.048***	0.022	0.024	0.025*
	(0.013)	(0.013)	(0.012)	(0.023)	(0.018)	(0.015)	(0.015)	(0.015)
Constant	0.342***	0.420***	0.354***	0.248***	0.096	0.340***	0.424***	0.355***
	(0.039)	(0.031)	(0.037)	(0.082)	(0.126)	(0.047)	(0.038)	(0.046)
Observations	4,112	4,112	4,112	3,037	3,037	3,037	3,037	3,037

Table A7: Financial fragility (Make ends meet), unweighted sample

The dependent variable for all regressions is a dummy variable indicating if a household can make ends meet “with great difficulty" or "with some difficulty" and zero of if they can make ends meet "fairly easily" or "easily". This table contains OLS and 2SLS regressions (in columns 4 and 5) in which financial literacy is instrumented for. Columns 1-3 depict results for the full sample size of N=4,112. Columns 4-8 show a reduced sample size (N=3,037) due to 2SLS approach applied. The sample size is smaller because individuals need to have been observed in both survey waves. These regressions are not weighted. Rubin’s rule was used to adjust standard errors for imputations. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Variables	(1) OLS	(2) OLS	(3) OLS	(4) 2SLS	(5) 2SLS	(6) OLS	(7) OLS	(8) OLS
Financial literacy: Compound Interest	-0.041***					-0.040**		
	(0.014)					(0.016)		
Financial literacy: Inflation	0.021					0.006		
	(0.018)					(0.021)		
Financial Literacy: Risk	-0.039***					-0.039***		
	(0.011)					(0.012)		
Big Three correct		-0.033***		-0.144**			-0.034***	
		(0.010)		(0.061)			(0.011)	
Number of Big Three correct			-0.026***		-0.094***			-0.029***
			(0.006)		(0.030)			(0.007)
Reference category: Number of children = no children								
1 child	0.036*	0.035*	0.035*	0.049**	0.048**	0.047**	0.046**	0.046**
	(0.019)	(0.019)	(0.019)	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)
2 children	0.040*	0.040*	0.039*	0.031	0.032	0.030	0.028	0.029
	(0.021)	(0.021)	(0.021)	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)
3 or more children	0.098***	0.099***	0.097***	0.099***	0.094***	0.103***	0.105***	0.103***
	(0.032)	(0.032)	(0.032)	(0.035)	(0.035)	(0.035)	(0.035)	(0.035)
Reference category: Age = 36-50 years								
18-35 years	-0.030	-0.033*	-0.031	0.022	0.028	0.029	0.027	0.028
	(0.020)	(0.020)	(0.020)	(0.026)	(0.026)	(0.025)	(0.025)	(0.025)
51-65 years	-0.014	-0.013	-0.013	-0.005	-0.003	-0.004	-0.003	-0.003

	(0.016)	(0.016)	(0.016)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
>65 years	-0.157***	-0.153***	-0.153***	-0.144***	-0.143***	-0.143***	-0.140***	-0.140***
	(0.024)	(0.024)	(0.024)	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)
Female	0.004	0.005	0.004	-0.011	-0.012	-0.003	-0.002	-0.003
	(0.010)	(0.010)	(0.010)	(0.012)	(0.012)	(0.011)	(0.011)	(0.011)
Reference category: Employment status = Employed and earning wage or salary (HH head)								
Self-employed	0.092***	0.089***	0.090***	0.067***	0.070***	0.067***	0.064***	0.065***
	(0.020)	(0.020)	(0.020)	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)
Not employed	0.097***	0.096***	0.097***	0.101***	0.101***	0.100***	0.100***	0.100***
	(0.021)	(0.021)	(0.021)	(0.025)	(0.025)	(0.024)	(0.024)	(0.024)
Retired	0.072***	0.072***	0.072***	0.060***	0.061***	0.068***	0.068***	0.067***
	(0.020)	(0.020)	(0.020)	(0.022)	(0.022)	(0.021)	(0.021)	(0.021)
Reference category: Education (ISCED 1997 classification) = Post-secondary non-tertiary education								
Lower secondary education or less	0.139***	0.139***	0.136***	0.125***	0.121***	0.135***	0.138***	0.135***
	(0.025)	(0.025)	(0.025)	(0.029)	(0.029)	(0.028)	(0.028)	(0.028)
Upper-level secondary school	-0.044	-0.047	-0.046	0.084**	0.078*	0.067*	0.065	0.065
	(0.032)	(0.032)	(0.032)	(0.042)	(0.041)	(0.041)	(0.041)	(0.041)
Tertiary education	-0.031***	-0.034***	-0.034***	-0.006	-0.008	-0.020*	-0.023*	-0.022*
	(0.011)	(0.011)	(0.011)	(0.015)	(0.013)	(0.012)	(0.012)	(0.012)
Reference category: Marital status = Single								
Married	0.052***	0.052***	0.051***	0.058***	0.057***	0.063***	0.063***	0.063***
	(0.017)	(0.017)	(0.017)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)
Divorced	0.082***	0.082***	0.082***	0.086***	0.086***	0.085***	0.085***	0.086***
	(0.021)	(0.021)	(0.021)	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)
Widowed	-0.048**	-0.047**	-0.048**	-0.041	-0.040	-0.033	-0.033	-0.033
	(0.023)	(0.023)	(0.023)	(0.026)	(0.026)	(0.025)	(0.025)	(0.025)
Separated	0.086**	0.087**	0.086**	0.088**	0.079*	0.083**	0.084**	0.082**
	(0.034)	(0.034)	(0.034)	(0.042)	(0.042)	(0.042)	(0.042)	(0.042)
With partner	0.067**	0.068***	0.066**	0.057*	0.046	0.052	0.055*	0.052
	(0.026)	(0.026)	(0.026)	(0.033)	(0.033)	(0.032)	(0.032)	(0.032)

Reference category: East vs. West Germany = 0, West (Current residency)								
East vs. West Germany = East	0.024**	0.023*	0.023*	0.017	0.019	0.021	0.020	0.020
	(0.012)	(0.012)	(0.012)	(0.014)	(0.014)	(0.013)	(0.014)	(0.013)
Reference category: Net income quintile = 3rd quintile								
1st quintile	0.268***	0.271***	0.268***	0.240***	0.228***	0.244***	0.248***	0.244***
	(0.019)	(0.019)	(0.019)	(0.023)	(0.024)	(0.022)	(0.022)	(0.022)
2nd quintile	0.061***	0.062***	0.062***	0.073***	0.069***	0.074***	0.077***	0.075***
	(0.018)	(0.018)	(0.018)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)
4th quintile	-0.075***	-0.074***	-0.074***	-0.062***	-0.062***	-0.066***	-0.066***	-0.066***
	(0.015)	(0.015)	(0.015)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
5th quintile	-0.146***	-0.146***	-0.145***	-0.125***	-0.126***	-0.135***	-0.135***	-0.135***
	(0.016)	(0.016)	(0.016)	(0.018)	(0.018)	(0.017)	(0.017)	(0.017)
Treatment: new risk question	-0.001	0.002	0.002	-0.022	-0.018	-0.004	-0.001	-0.002
	(0.010)	(0.010)	(0.009)	(0.015)	(0.013)	(0.011)	(0.011)	(0.010)
Constant	0.187***	0.163***	0.207***	0.211***	0.355***	0.168***	0.130***	0.183***
	(0.029)	(0.023)	(0.028)	(0.051)	(0.083)	(0.033)	(0.026)	(0.032)
Observations	4,112	4,112	4,112	3,037	3,037	3,037	3,037	3,037

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