The household savings paradox

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Abstract – Using representative data from Germany, we reveal that more than 27.3% of the population not only restrains from participating in the stock market but also refuse to invest in contractual savings and retirement products. In fact, we find that these households rely on deposits only - an investment strategy usually related to negligible and recently to negative inflation-adjusted returns. Because these households forgo the equity risk-premium, on the one hand, as well as state subsidies associated with comparable safe products on old-age provision, on the other hand, we call this phenomenon the 'household savings paradox'. We provide novel evidence that financial literacy and financial advice strongly decrease the likelihood to save paradoxically. Our results emphasize the important role of financial literacy and financial advice for sound financial decision-making in a rapidly changing and growing landscape of financial products.

Keywords: Financial advice, financial literacy, savings and investment behavior
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1 Introduction

This study investigates the determinants that cause 27.3% of German households to refuse investments in any other asset class other than deposits. In addition to nonparticipation in the stock market, these households ignore even low-risk contractual savings and retirement products, such as state-subsidized private pension plans (Bucher-Koenen and Lusardi, 2011). This observation largely extends the well-documented finding of nonparticipation in the stock market and is quite surprising for the following reasons. First, private pension schemes in Germany substantially differ from those in the US. Contractual savings and retirement products in Germany are subject to the German Deposit Guarantee Act or similar legal regulations, which entirely guarantee the capital preservation. In contrast, 401(k) plans and investment retirement accounts (IRAs) do not guarantee the capital preservation of individuals' initially invested amounts. Thus, while 401(k) plans or IRAs (in the worst case) entail the risk of a total loss of invested capital, this risk does not apply to any type of contractual savings or retirement product. Similarly, contractual savings and retirement products in Germany provide households with a unique and safe investment alternative to deposits, especially with households' persistently low levels of risk tolerance in mind. However, while risk tolerance might be a strong predictor of households' nonparticipation in the stock market this relationship should not apply to contractual savings and retirement products in our sample. Second, although they are less liquid and more complex, contractual savings and retirement products provide higher expected returns than deposits, which usually provide negligible returns in real terms (see, for example Deutsche Bundesbank, 2017a; Institut für Vorsorge und Finanzplanung, 2016). In addition, contractual savings and retirement products often provide individuals with tax advantages and state subsidies (Börsch-Supan, Coppola, and Reil-Held, 2012). Hence, under the assumption of no investment risk, long-term financial goals, and appropriate liquidity resources, entirely relying on

deposits while other investments would yield higher expected returns is paradox. Thus, we call the phenomenon of households entirely relying on deposits the *'household savings paradox'*.[1]

While the literature has not yet elaborated on the household savings paradox, households' nonparticipation in the stock market has already gained substantial attention. The existing studies have found a variety of determinants for households' nonparticipation in the stock market, for example, fixed costs of participation (Haliassos and Bertaut, 1995; Vissing-Jørgensen, 2003) or lower levels of risk tolerance and ambiguity aversion (e.g., Antoniou, Harris, and Zhang, 2015; Dimmock, Kouwenberg, Mitchell, and Peijnenburg, 2016; Shum and Faig, 2006). In particular, households with lower levels of risk tolerance have been found to be less likely to hold risky financial assets. However, risk tolerance might not solely explain why households refuse to invest in contractual savings and retirement products.

Another determinant of households' nonparticipation in the stock market that recently gained substantial attention is households' financial literacy. More precisely, financially literate households were found to more frequently participate in the stock market (van Rooij, Lusardi, and Alessie, 2011), to hold better diversified portfolios[2] (Goetzmann and Kumar, 2008; Guiso and Jappelli, 2008) and to be more likely to plan for retirement (Bucher-Koenen and Lusardi, 2011; van Rooij, Lusardi, and Alessie, 2012). Further, studies have suggested that financially literate households possess the relevant knowledge to understand even more complex financial products, such as private pension plans (Börsch-Supan et al., 2012; Bucher-Koenen, 2009).

[1] Throughout this paper, we use the terms 'household savings paradox' and 'paradoxical savings behavior' interchangeably. Further, we call households prone to this behavior 'paradoxical savers'.

[2] The studies that we refer to most commonly define an investor's portfolio as any assets held in a securities account. However, in our study we consider households' total financial assets, which, in addition to assets held in a securities account, further comprise deposits and contractual savings and retirement accounts.

Finally, research has frequently emphasized the relationship between financial advice and households' investment decisions. According to Collins (2012), a financial advisor's role is to provide customers with product-related information and to defuse biases associated with common investment mistakes. In doing so, financial advisors are a strong determinant of households' asset allocation decisions (Foerster, Linnainmaa, Melzer, and Previtero, 2017). Analyzing the role of financial advice on households' stock holdings, Shum and Faig (2006) revealed that financial advice and households' engagement in the stock market are positively correlated. Further, studies have shown that advised households hold better diversified portfolios (Bluethgen, Gintschel, Hackethal, and Mueller, 2008) and achieve higher-risk adjusted returns (von Gaudecker, 2015).

However, the existent literature has solely focused on the determinants of households' participation in the stock market. Our paper thus largely extends the frequently documented finding of nonparticipation in the stock market and reveals that households also shun investments in every asset class, in addition to deposits. This investment strategy is usually associated with negative expected returns in real terms, bearing substantial risks for households' retirement planning. However, what determines paradoxical savings behavior? We control for common determinants of stock market participation to determine whether they also affect paradoxical savings behavior. While households should not associate the risk of a total loss of invested capital with contractual savings and retirement products, these products are particularly more complex and less liquid than deposits. Therefore, we especially consider the roles of financial literacy and financial advice in mitigating paradoxical savings behavior for the following reason.

Because financial literacy is related to understanding the principles underlying financial products, we expect households with higher financial literacy levels to face fewer problems in sufficiently evaluating these financial products. Hence, we assume that financially literate households better understand more complex products such as contractual savings and retire-

ment products. Moreover, we presume that financially literate individuals are aware of the negative consequences of persistently low interest rates and thus, seek for comparable safe products with higher expected returns. We therefore suppose that financial literacy reduces paradoxical savings behavior.

With respect to financial advice, we expect advisors to play a pivotal role in providing households with product-related information. Further, financial advisors can inform and educate households about how to achieve long-term financial goals, such as savings for retirement. Similarly, they should raise awareness of the negative consequences of entirely holding deposits, which usually provide negative returns in real terms. Last but not least, it is a financial advisor's job to sell appropriately risky financial assets to his or her clients. Hence, we expect advised households to be less prone to paradoxical savings behavior.

To test whether financial literacy and financial advice mitigate paradoxical savings behavior, we use the novel Panel on Household Finances (PHF), a nationally representative German household survey provided by the German Central Bank (Deutsche Bundesbank).

Our contribution to the literature is threefold. First, we introduce the previously unconsidered household savings paradox, which largely extends households' nonparticipation in the stock market. Paradoxical savings behavior is a population-wide phenomenon that jeopardizes households' wealth accumulation, especially in the context of achieving long-term financial goals, such as sufficient retirement preparedness. We exclude alternative explanations for paradoxical savings behavior, such as households' liquidity needs and insufficient financial resources. Moreover, we control for paradoxical savings behavior being driven by retired households, which, according to the life-cycle hypothesis of saving, usually possess less risky financial assets and are no longer eligible to enroll in contractual savings and retirement products. Further, we account for potential traumatic experiences during the financial crisis, such as considerable wealth losses, as an explanation for paradoxical savings behavior.

In our second contribution, we particularly elaborate on the determinants of paradoxical savings behavior. Our results reveal that financial literacy and financial advice strongly decrease paradoxical savings behavior. To preview our key results, we document that a one-unit increase in financial literacy reduces paradoxical savings behavior by 4.7 percentage points. Moreover, we find advised households to be 12.5 percentage points less likely to save paradoxically, compared to their unadvised counterparts. This result strongly supports our initial hypothesis that financial literacy and financial advice can largely reduce households' perceived complexity regarding these products. However, how do financial literacy and especially financial advice decrease paradoxical savings behavior?

We answer this question in our third contribution. In particular, we reveal a potential mechanism of how financial literacy and financial advice might help to mitigate paradoxical savings behavior. Since households prone to the savings paradox entirely rely on deposits, we investigate whether financially literate and advised households decrease their initial deposit holdings in favor of spreading the freed-up resources to other asset classes. Our results suggest that a one-unit increase in financial literacy decreases households' deposit holdings by 6.5 percentage points, and advised households show deposit holdings of 5.1 percentage points less than their unadvised counterparts. Further, using a proxy for households' financial asset diversification as proposed by Shin, Seay, and Kim (2017), we reveal that financially literate and advised households hold better diversified financial assets.

We show the effect of financial literacy to be robust against potential endogeneity using instrumental variable regression by Lewbel (2012). Further, we address endogeneity concerns regarding financial advice using a propensity score matching approach in conjunction with sensitivity analysis to control for potential 'hidden bias' due to unobserved variables.

The remainder of this paper is organized as follows. To begin, we provide a detailed description of German households' savings and investment behaviors in the institutional framework in section 2. Moreover, we present our identification strategy for paradoxical savings behavior

and introduce our hypotheses. We provide a detailed description of our data in section 3. Subsequently, we present our empirical results of the determinants of households' paradoxical savings behavior and present a potential mechanism for how financial literacy and financial advice mitigate this behavior in section 4. Next, we conduct robustness tests, especially to mitigate potential endogeneity concerns. Finally, section 5 provides a summary of the main results obtained in our study.

2 Institutional Framework

2.1 Savings and Investment Behavior in Germany

In the US, 50% of households participate in the stock market, while European households are more hesitant. In Finland, Spain and France, approximately 34%, 25% and 23% of the households, respectively, still participate in the stock market, and in the Netherlands and Italy, participation rates are once again lower at approximately 19% and 12%, respectively. In Germany, Europe's largest economy, approximately 24% of the population engage in the stock market, which is quite average among European countries but dramatically lower than in the US (Badarinza, Campbell, and Ramadorai, 2016). This finding is quite remarkable, considering that German households exhibit higher savings rates compared to the US. For instance, savings as a percentage of disposable income equals approximately 6% in the US, whereas in Germany, households exhibit constant savings rates of approximately 10% (OECD, 2017a). The low stock market participation rates in Germany and other European countries might be due to households traditionally accumulating wealth through savings accounts (OECD, 2017b). In the past, this behavior was not as detrimental as today, since households could rely on sufficient state-granted retirement plans, thus, stock market participation was not strictly necessary to provide sufficient old-age provisions. Currently, households' nonparticipation in asset classes with higher expected returns is especially critical, considering the lingering low interest rates and households' increased responsibility for their own financial well-being due to recent reforms in government

pension systems, resulting in reductions of state-granted retirement provisions (Bucher-Koenen, 2009).

Table I shows the investment behavior of German households.[3] The goal of our study is to obtain a holistic view of households' asset allocation. Hence, in contrast to solely focusing on risky financial assets commonly investigated by, for example, von Gaudecker (2015) and van Rooij et al. (2011), we provide a disaggregated picture of households' entire financial asset universe. We thereby define risky financial assets as any assets held in a securities account, namely, mutual funds, stocks, bonds, and other securities.[4] In addition, we further assess households' holdings of deposits and contractual savings and retirement products.

[Please insert Table I about here.]

Table I shows that average German households possess total financial assets of €57,090 and that 25.3% of German households hold any risky financial assets that usually provide the chance to achieve positive inflation-adjusted returns. This result is in line with Bannier and Neubert (2016b), who found approximately 23.0% of German households' to possess risky assets. Disaggregating risky financial assets, we find that 18.7% (12.0%) of German households hold mutual funds (stocks). Further, 6.1% of Germans possess bonds, and 2.6% engage in other securities, such as investment certificates.

As Table I shows, although less flexible and more complex than deposits due to a fixed contract period, contractual savings and retirement products play significant roles in German households' retirement preparedness (Börsch-Supan et al., 2012).[5] One such form consists of

[3] Please note that we exclude households from our analysis that do not own any financial assets.

[4] Other securities include especially certificates that, according to Bannier and Neubert (2016b) can be considered more sophisticated investment products.

[5] During the contract term, investments in contractual savings and retirement products are only accessible if the customer cancels the contract. In the event of early termination, customers commonly lose state subsidies or granted tax advantages, and

Riester/Rürup contracts, which are held by 54.2% of German households. Riester/Rürup plans are state-subsidized retirement plans in which households pay monthly fees, for which they receive a subsidized bonus (Bucher-Koenen and Lusardi, 2011). Contract partners are commonly banks and insurance companies, which must guarantee capital preservation. In this regard, private pension schemes differ substantially between Germany and the US. While private pension schemes in the US, such as 401(k) plans or IRAs, also provide individuals with tax advantages such as Riester/Rürup plans in Germany, they are far less secure in terms of capital preservation. In particular, a large share of the money held in 401(k) plans and IRAs is invested in mutual funds or stocks. Hence, the investments are affected by market up- and downturns so that capital preservation might not be guaranteed. For instance, in cases of sharp decreases in investment value, individuals will not be refunded the amounts that they initially invested. In contrast, all types of Riester/Rürup guarantee to refund the amount initially invested by individuals. Hence, while 401(k) plans or IRAs entail the risk of a total loss of invested capital, this risk does not apply to any type of Riester/Rürup plan.

Beyond Riester/Rürup contracts, Table I shows that life insurance plays a significant role in German households' retirement planning. In fact, 31.0% of Germans have an endowment life insurance, typically equipped with guaranteed interest rates and profit participation. Thereby, households' endowment life insurance is by law held in a spate estate, which must be kept separate from the rest of the company to protect the investments from potential bankruptcy.[6]

As another form of contractual savings and retirement products, we consider building loan contracts, which are very common, especially among households interested in becoming homeowners. Building loan contracts are very popular in Germany, and more than 38.3% of German

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they receive only the buy-back value of their insurance policies or pension contracts. Thus, early termination of these contracts is associated with a sharp reduction in expected returns.

[6] This spate estate is controlled by the German Federal Financial Supervisory Authority (BaFin).

households own them. After signing a contract with a building loan association, a household constantly saves a monthly amount of money (savings phase) until it attains a minimum savings amount (approximately 40 to 50 percent) of the total contract sum. Especially low-income households are eligible for state subsidies such as the 'Wohnungsbauprämie' (housing subsidy). After the savings phase, the household is granted a building-society loan, which equals the full contract sum with a constant interest rate over time (Hackethal, 2004).

Next, Table I also reveals that deposit holdings in Germany are quite prominent. Moreover, deposits are the least complex form of financial products in our sample. On average, approximately 86.5% of respondents own a checking account, and 77.3% report having a savings account. Due to the widespread use of cash cards in Germany, which are broadly accepted as a payment method there, deposits held in bank accounts are quite prominent in terms of liquidity, such as cash. Further, they can be considered as secure because, up to an amount of €100,000, they are protected by the German Deposit Guarantee Act. Most banks also create deposit protection funds to guarantee even higher amounts.[7] On the downside, deposits yield negative inflation-adjusted returns, because the average interest rate on deposits has sharply declined over the last few years. For instance, the average annual inflation-adjusted return on deposits at the time our data were collected was -0.5%, while today, the return is highly negative at approximately -1.5% (Deutsche Bundesbank, 2017).

2.2 The Household Savings Paradox

2.2.a What is paradoxical savings behavior?

In this study, we define households as paradoxical savers that entirely rely on deposits, thereby refusing investments in both risky financial assets, on the one hand, and contractual savings and

[7] According to the Bundesverband deutscher Banken e.V., more than 150 banks participate in deposit protection funds. For further information, please refer to www.einlagensicherungsfonds.de.

retirement products, on the other hand. This investment strategy is usually associated with negative expected returns in real terms, whereas comparable safe asset classes, such as contractual savings and retirement products, would indeed yield higher expected returns.[8]

[Please insert Figure 1 about here.]

In Figure 1, we show the proportion of households prone to paradoxical savings behavior among different wealth quartiles. We start from the observation that a tremendous proportion of 27.3% of the whole population is prone to paradoxical savings behavior. Our results further suggest that the household savings paradox decreases in wealth. Nevertheless, Figure 1 shows that, while 43.8% of households in the lowest wealth quartile are paradoxical savers, 16.8% of households in the highest wealth quartile still entirely rely on deposits. Thus, paradoxical savings behavior seems to be a phenomenon that is also present among the wealthiest households in our sample. In this context, our findings extend the observation of Heaton and Lucas (2000), since we show that wealthy households not only refuse investments in the stock market but also in comparably safe asset classes, in addition to deposits. Moreover, that paradoxical savings behavior is also apparent among wealthier households further casts doubt on wealth-related participation costs being the sole reason for households' nonparticipation in certain financial asset classes (Vissing-Jørgensen, 2003).

[8] Please note that we exclude alternative explanations for this irrational investment behavior, such as households' liquidity needs, in section 4.

How does paradoxical savings behavior affect households' expected returns?

To illustrate the consequences of paradoxical savings behavior, we use additional data on the inflation-adjusted returns of various asset classes for German investors provided by the German Central Bank (Deutsche Bundesbank, 2017).[9]

[Please insert Figure 2 about here.]

In Figure 2, we provide an investment scenario using the historical return performance for deposits, stocks, investment funds and claims on insurance companies (e.g. endowment life insurances), based on quarterly returns ranging from December 1996 to March 2017. As seen from the bold black line in Figure 2, deposits yield the lowest inflation-adjusted returns, compared to all other asset classes. More precisely, while the inflation-adjusted return on an investment 20 years ago equals 0.1% per year for deposits, the average yearly returns for stocks, investment funds and claims on insurance companies are remarkably higher, at 10.2%, 6.3% and 5.1%, respectively. Moreover, interest rates on deposits dropped during the last few years so that investors recently achieve only negative inflation-adjusted returns with deposits. As already mentioned, a household classified as a paradoxical saver entirely relies on deposits, despite other safe asset classes, such as products offered by insurance companies, indeed yielding higher returns.[10] Thus, we find that households prone to paradoxical savings behavior indeed make unfavorable decisions in terms of their savings decisions.

[9] Unfortunately, the PHF data lack returns on individual investors' financial assets. Instead, we use aggregated data on average investors' inflation-adjusted returns provided by the German Central Bank which are the best estimates for returns on assets in our sample. We thank the German Central Bank for sharing the data on inflation-adjusted returns with us.

[10] Please note that inflation-adjusted returns on claims for insurance companies are, at any point in time, higher than those on deposits. Hence, this result is not biased by specific market timing.

Paradoxical savings behavior and its consequences for households' financial asset diversification

Next, we illustrate the consequences of paradoxical savings behavior for households' financial asset diversification. From an economic perspective, although diversification does not entirely protect against potential losses, it can be considered the most important tool to achieve long-term financial goals while minimizing risk. To measure the extent of households' diversification among the nine asset classes provided in Table I, we use a proxy for diversification especially suited to household survey data, as proposed by Shin, Seay, and Kim (2017). Unfortunately, our data lack correlations of assets held in households' total financial assets. Therefore, in contrast to modern portfolio theory, we must resort to a cruder approach. We proxy for diversification using a measure that combines two important dimensions of diversification, in particular, the number of asset classes held in households' total financial assets and the concentration of households' financial assets in each asset class:

$$Diversification_i = 1 - \sum_{j=1}^{J} \left(\frac{Amount\ invested\ in\ asset_{j,i}}{Total\ financial\ assets_i} \right)^2 \qquad (1)$$

where j denotes the respective asset class and higher values indicate better diversified financial assets. More precisely, the measure $Diversification_i$ in Equation (1) takes the value of zero if a household i invests all available financial assets in one single asset class, whereas a household that invests equal amounts in all available asset classes will have a diversification measure of one.

[Please insert Figure 3 about here.]

Figure 3 presents households' financial asset diversification distinguishing between paradoxical saving households (i.e., paradoxical savers) and those that do not entirely rely on deposits (i.e., non-paradoxical savers). In general, the proxy for households' diversification, on average, equals 0.4 (dashed line) for the whole sample. However, paradoxical savers exhibit a much

lower diversification measure of 0.16, compared to 0.49 for non-paradoxical savers. Such savings behavior is particularly severe in terms of households' retirement provision, because these households forego considerable investment opportunities that would sharply enhance their retirement preparedness.

2.2.b Determinants of paradoxical savings behavior

Financial literacy

When households select financial products, they can face problems in sufficiently evaluating these products probably due to the products' complexity. For instance, private pension plans, such as Riester/Rürup contracts, have been shown to be very complex, and households frequently fail to understand the principles underlying them (Börsch-Supan et al., 2012; Bucher-Koenen, 2009). This notion is supported by experimental evidence on judgment and decision-making showing that individuals prefer less complex lotteries, indicating that households' participation costs are increased by the products' complexity, thus preventing them from investing in more sophisticated asset classes (Duttle and Inukai, 2015). It is likely that, because financial markets and product diversity have grown tremendously over the last two decades (Celerier and Vallee, 2013), households might lack the appropriate skills to manage the increased complexity in rapidly changing environments.

In this light, households' financial sophistication, commonly referred to as financial literacy, has received considerable attention (Lusardi and Mitchell, 2014; Stolper and Walter, 2017). Analyzing household survey data from the Netherlands, van Rooij, Lusardi, and Alessie (2011b) documented that both self-assessed and measured financial literacy decrease retail investors' nonparticipation in the stock market.[11] Yoong (2011) further found a positive correlation between households' financial literacy and the likelihood of owning mutual funds. Further, a large

[11] There is an ongoing debate on the gap between actual (objective) and perceived (subjective) financial literacy. For further information, please see especially Allgood and Walstad (2016), Bannier and Neubert (2016) and Bannier and Schwarz (2017).

number of studies have documented that financially literate individuals are more likely to plan for their retirement (e.g., Bucher-Koenen and Lusardi, 2011; Lusardi and Mitchell, 2011; van Rooij, Lusardi, and Alessie, 2012). We hypothesize that financially literate individuals could face lower product participation costs if they better understand complex financial products and thus are less likely to restrain themselves from participation in other asset classes than deposits.

Financial advice

Since there is an ongoing debate on whether financial literacy serves as an ultimate remedy for poor financial decision-making, recent literature has further elaborated on households' informational environments that might provide them with appropriate information about financial products. Thus, although basically any product can be bought, and any investment can be made online nowadays, the literature has particularly emphasized that a large proportion of households consult professional financial advisors before purchasing financial products (e.g., Chater, Huck, and Inderst, 2010; Hung and Yoong, 2013; Investment Company Institute, 2007). In theory, financial advisors possess the financial knowledge and experience that the households might lack and thus are able to provide their customers with product-related information and to defuse biases associated with common investment mistakes (Collins, 2012). Moreover, advisors might be able to reduce the perceived complexity of financial products, thereby decreasing households' associated risks with these products. However, the literature on financial advice remains relatively scarce, and results on the efficiency of financial advice regarding households' economic outcomes have been rather mixed. On the downside, recent studies have provided evidence that the portfolios of advised households underperform those of unadvised households (Bergstresser, Chalmers, and Tufano, 2009). Further, studies have revealed that advisors can encourage households to chase past returns and to hold actively managed funds, which usually come with higher management fees and front-up loads (Mullainathan, Noeth, and Shoar, 2012).

On the upside, other studies have shown that financial advisors add value by increasing households' portfolio[12] diversification (Bluethgen et al., 2008) and participation in the stock market (Shum and Faig, 2006). Moreover, in his seminal work, von Gaudecker (2015) showed that advised portfolios achieve higher-risk adjusted returns than unadvised portfolios. However, although the literature has provided mixed evidence on advisors' contribution, we agree with Foerster, Linnainmaa, Melzer, and Previtero (2017) that 'financial advisors are nevertheless a major determinant of asset allocation' (p. 1445). Moreover, the impact of financial advice on portfolio outcomes in terms of underperformance after accounting for management fees is less of a concern in light of our research question because studies investigating the impact of advice on return performance have mostly relied on brokerage data restricted to households that have not yet gained experience with investments in risky financial assets. Hence, these households only represent a small fraction of the whole population and are likely not representative of the investment behavior of an 'average' household. In contrast, we use representative survey data, including households with no such experience, and thus emphasize what encourages households to consider assets beyond deposits. In doing so, our research question fundamentally differs from those in prior studies of financial advice, because we are able to provide important implications at the population level. With this point in mind, we expect the role of financial advisors to reduce paradoxical savings behavior for the following reasons. First, households prone to paradoxical savings behavior might be not aware of all investment opportunities, whereas financial advisors, in theory, possess the relevant knowledge and are able to provide product-related information. Second, households that save paradoxically might especially shun products such as state-subsidized private pension plans due to their complexity. Moreover, these products require households to engage in long-sighted financial planning, and studies have shown

[12] A household's portfolio refers only to all assets held in a securities account and does not relate to the household's total financial assets.

that households often fail to make long-term financial decisions (Lusardi and Mitchell, 2007). In this vein, financial advisors might serve as information intermediaries, reducing households' perceived complexity of these products and supporting them in achieving their long-term financial goals.

3 Survey Data

To assess the determinants of individual investors' paradoxical savings behavior, we draw on the Panel on Household Finances (PHF), which is a nationally representative survey conducted by the German Central Bank (Deutsche Bundesbank). This study is based on data obtained between September 2010 and July 2011. All household data were collected by face-to-face interviews using a computer-aided personal interviewing system (von Kalckreuth, Eisele, Le Blanc, Schmidt, and Zhu, 2012). The PHF covers a wide range of items related to the household balance sheet of more than 3,500 randomly selected households. In particular, the data allow for profound insights into households' financial assets (e.g., stockholding, mutual funds and retirement provision products), as well as households' debt (e.g.; mortgage and consumer loans). In addition, the PHF data is supplemented by information about socio-demographic, psychological and financial literacy related characteristics. We provide detailed variable descriptions in Table A1 of the appendix. The PHF features survey weights that adjust for the oversampling of wealthy households during the data collection. Additionally, multiple imputation methods using the Markov-Chain-Monte-Carlo method have been applied to account for missing data due to item non-responses.[13] In accordance with Bucher-Koenen and Ziegelmeyer (2014) and Pauls, Stolper, and Walter (2016), we do not use multiple imputations for our dependent variables. For all of the independent variables, we use the average of the five imputed datasets.

[13] We apply the provided survey weights in all of our main analyses to obtain correct point estimates. For further information on the multiple imputation method used in the PHF, please see Zhu and Eisele (2013).

[Please insert Table II about here.]

Table II reports summary statistics for the whole sample, featuring all of the explanatory variables that were used in our analysis.[14] The average level of financial literacy in our sample equals 2.5, indicating that the respondents on average answered more than 2 of 3 financial literacy questions correctly. This result corresponds well to those of, for example, Bucher-Koenen and Ziegelmeyer (2014) or Meyll, Pauls, and Walter (2017), who used the same set of financial literacy questions regarding representative data from German households and found that the average numbers of correctly answered financially literacy questions were 2.4 and 2.5, respectively.[15] Of the households in our sample, 27.2% obtained financial advice, while 72.8% reported that they did not consult their financial advisor over the last two years. Furthermore, households in our sample are prone to being rather risk averse, with average financial risk tolerance of 1.4 (scale from 1 to 4, with lower values indicating higher risk aversion), and they exhibit trust levels of 5.5 (scale from 0 to 10 with lower values indicating greater distrust of people). With respect to households' socio-demographics, 52.1% of the respondents are male, and 51.7% are married. The average respondent in our sample is 52.3 years old. Following Dick and Jaroszek (2015), Stolper (2017), and Meyll, Pauls, and Walter (2017), education is measured as a categorical variable that denotes the level of the respondents' education from primary (0) to post-tertiary (3). The average educational level in our sample is 0.6. In terms of labor market status, 3.4% of respondents report being unemployed, 6.9% are self-employed, and 32.6% are retired.[16] The average household earns monthly net income of €2,430, and their net wealth equals €169,090. Finally, 44.4% of sampled households report being homeowners,

[14] We exclude households that report not having any financial assets from our analysis.

[15] Bucher-Koenen and Ziegelmeyer (2014) used representative SAVE data from 2009, and Meyll et al. (2017) also use the PHF.

[16] This result is in line with other studies analyzing German household survey data, for example, Bucher-Koenen and Lusardi (2011), who found 33% of the German population to be retired.

29.3% experienced a positive wealth shock, such as receiving larger gifts or inheritances, and 60.4% state that are regularly saving each month.

4 Empirical Results

4.1 Does Financial Literacy and Financial Advice Reduce Paradoxical Savings Behavior?

In this section, we empirically test our hypothesis that higher levels of financial literacy and the receiving of financial advice mitigate households' paradoxical savings behavior. To model the relationships among financial literacy, financial advice, our control variables, and households' propensity to exhibit paradoxical savings behavior, we use a series of Probit regressions following the equation of the following form:

$$P(Paradox_i = 1|x) = \alpha + \beta_1 * FL_i + \beta_2 * FA_i + \gamma' c_i + \varepsilon_i \qquad (2)$$

where FL_i and FA_i represent the analyses' main variables financial literacy and financial advice for a respective household i. The vector c_i are control variables, including households' risk tolerance, monthly labor net income (log) and net wealth (log), educational level, trust, gender, marital status, age[17], occupational status, homeownership and whether the respondent received an unexpected increase in wealth, such as large gifts or inheritances. Additionally, we also control for households' attitudes toward savings in terms of whether they regularly save each month.

[Please insert Table III about here.]

In Table III, we report results of a series of Probit regressions using the regression framework in Equation (2). In columns (1) to (3) we report the average marginal effects, and in column (4), we report the coefficients of the Probit regressions. Column (1) of Table III presents the regression results using financial literacy and the full set of control variables as explanatory variables.

[17] We also include the squared term of age in our regression model to account for the non-linear relationship between financial decisions and respondents' ages.

In column (2), we regress paradoxical savings behavior on our main explanatory variables financial advice and controls, and in column (3), we provide results of our main model, in which we jointly control for financial literacy and financial advice. Column (4) reports a regression including an interaction term of financial literacy and financial advice to control for the potential heterogeneous effects of financial literacy between advised and unadvised households as well as the control variables.

In column (1), we test our first hypothesis that financial literacy should mitigate the household savings paradox due to households' better understanding of financial products. The average marginal effect of financial literacy in column (1) indicates that a one-unit increase in financial literacy decreases paradoxical savings behavior by 5.4 percentage points. More precisely, a respondent with the lowest financial literacy score of zero is 16.2 percentage points more likely to save paradoxically compared to a respondent with the highest possible financial literacy score of three. These results support our assumption that financially illiterate households might face problems in sufficiently evaluating more complex financial products and thus refuse to invest in those products.

Next, with respect to financial advice, we expect financial advisors to reduce households' perceived complexity of financial products beyond deposits and thus advised households to less frequently exhibit paradoxical savings behavior. In column (2), we test this hypothesis and find that financial advice strongly reduces households' propensity to save paradoxically. The average marginal effects suggest that advised households are 13.4 percentage points less likely to save paradoxically.

In column (3), we present our main model, in which we jointly control for financial literacy and financial advice. According to the average marginal effect of financial advice in column (3), we find our initial hypothesis to be strongly supported. In addition to being highly significant in statistical terms, this effect is also economically meaningful. Advised households are approximately 12.5 percentage points less likely to save paradoxically. Further, we document

that financial literacy is still highly statistically significant with a mitigating effect of 4.7 percentage points, indicating that financial literacy still has an effect on households' paradoxical savings behavior once we control for receiving financial advice.

With respect to the set of control variables in column (3) of Table III, we show that paradoxical savings behavior decreases with increasing levels of risk tolerance. More precisely, a respondent with the lowest risk tolerance of one is approximately 20.9 percentage points more likely to save paradoxically, compared to a respondent with the highest risk tolerance of four. To test whether households also associate significant risks with investments in contractual savings and retirement products, we re-estimate our main model, excluding households with any risky financial assets. In doing so, paradoxical savings behavior reflects the decision to entirely rely on deposits when choosing between deposits and contractual savings and retirement products. The results suggest that the effect of financial risk tolerance is insignificant in this specification. Hence, the effect of financial risk tolerance in Table III is mainly driven by households' aversion from investing in risky financial assets.[18] Moreover, we document an u-shaped effect of age, indicating that paradoxical savings behavior is more prominent among younger and elderly households, consistent with the life-cycle hypothesis of saving (Ando and Modigliani, 1963; Cocco, Gomes, and Maenhout, 2005). Moreover, married and retired households are more likely to entirely rely on deposits and cash. Regarding retired households, this finding is not surprising because the life cycle hypothesis proposes that elderly households should allocate their financial resources to less risky assets, such as deposits. Other control variables related to households' financial positions, such as households' net income and wealth or positive wealth shocks, generally reduce households' propensity to be prone to the household saving paradox. Moreover, households with higher educational level less often save paradoxically.

[18] The results are unreported and available upon request.

Finally, in column (4), we test whether the effect of financial literacy on households' propensity to save paradoxically varies between advised and unadvised households. Hence, we build an interaction effect of financial literacy and financial advice. The interaction effect is economically small and statistically insignificant, indicating that the effect of financial literacy does not vary between advised and unadvised households.

Financial wealth

To ensure that our main results are not solely driven by wealth effects, we re-estimate our baseline model from column (3) of Table III in Table IV, using various subsamples.

[Please insert Table IV about here.]

In column (1), we restrict our sample to households in the highest financial wealth quartile. Although decreased in economic magnitude, the effects of financial literacy and financial advice on paradoxical savings behavior remain highly statistically significant. Hence, the results confirm that our main results from column (3) of Table III do not exclusively stem from less wealthy households entirely relying on deposits. Moreover, this finding allows us to conclude that paradoxical savings behavior is also apparent among wealthier households and the underlying determinants seem to be the same.

Liquidity

Next, in column (2) of Table IV, we consider that households might avoid investments in risky financial assets or contractual savings and retirement products because they must rely on deposits to offset potential income disruptions or to cover regular liquidity needs. Moreover, households might only invest in other assets beyond deposits when precautionary needs are satisfied (Barasinska, Schäfer, and Stephan, 2012). Therefore, we adopt empirical findings from the literature on households' emergency fund savings first conceptualized by Johnson and Widdows (1985). The authors defined emergency funds as households' financial holdings in

liquid assets, including cash, savings- and checking accounts, which cover the households' liquidity for at least three months. Moreover, these liquid savings should ensure that households do not have to alter their living standards due to income disruptions, such as unemployment or illness. Researchers and financial planners recommend that households hold at least two to six months of monthly income in liquid savings (i.e., cash, savings-, and checking accounts).[19] However, we believe that liquidity reserves of two months of income might (sometimes) be far too small, especially for households that might be more in danger of suffering from unexpected shocks to income. Hence, we assess households' excess liquidity using a benchmark that we calculate as households' liquid savings divided by households' six-month income. We apply this measure in column (2) of Table IV and restrict our sample to households that carry more than six months of income in deposits. Although this restriction is very strong, our results reveal that inferences about the effects of financial literacy and financial advice on paradoxical savings behavior remain unchanged. Hence, the results of this subsample analysis generally suggest that households' liquidity needs fail to explain why households save paradoxically.[20]

Retirement

The traditional life-cycle hypothesis predicts that households tend to slowly decrease their risky financial asset shares of total financial assets when they come close to retirement. Moreover, households that are already retired sometimes might not even be eligible to enroll in private

[19] For instance, Gathergood and Weber (2014) used a similar measure of liquid savings to assess households' financial resources available to pay down outstanding consumer credit balances. For an extensive overview of different emergency fund levels, please see especially Chang, Hanna, and Fan (1997).

[20] In additional analyses, we also use other recommended measures such as two-month and three-month income. The results remain virtually unchanged and are available upon request.

pension plans or endowment life insurance anymore.[21] In this context, if retired households are not eligible to invest in contractual savings and retirement products, their investment opportunities are restricted to deposits and risky financial assets. Hence, our measure of paradoxical savings behavior would simply reflect households' decisions to refuse investments in risky financial assets. To ensure that paradoxical savings behavior is indeed an extension of the well-documented finding of nonparticipation in the stock market, we exclude households from our sample that are already retired. The results of this subsample analysis are reported in column (3) of Table IV and remain virtually unchanged, compared to the results of our main model presented in column (3) of Table III. Thus, this result favors our initial assumption that paradoxical savings behavior is an extension of, and not a substitute for, nonparticipation in the stock market.

Potential impact of the financial crisis

Finally, we account for households simply avoiding investments in other assets besides deposits because they suffer from potentially traumatic experiences with investments in, for example, the stock market. One such event that affected a large proportion of households worldwide was the recent financial crisis (Bucher-Koenen and Ziegelmeyer, 2014). In column (4) of Table IV, we address this issue and exclude households from our analysis that report that their net worth considerably decreased over the last two years. Because our data at hand were collected between 2010 and 2011, we thereby capture households that experienced wealth losses during and immediately after the financial crisis. Even after excluding these households, our main results

[21] Please note that retired households, of course, might possess savings in retirement accounts, such as state-subsidized private pensions, because they only gradually diminish their initial savings once they retire. However, when they retire, they are not eligible to enroll in new contracts.

regarding financial literacy and financial advice remain robust, indicating that potentially traumatic experiences, such as the financial crisis, do not explain why households save paradoxically.

4.2 How do Financial Literacy and Financial Advice Help?

4.2.a The effects on households' deposit holdings

Despite the previous section showing that financial literacy and financial advice strongly reduce paradoxical savings behavior, we have not yet explored how households' financial literacy and especially financial advisors mitigate this behavior. Thus, we consider a potential mechanism of how our main variables might reduce paradoxical savings behavior. While the prior results suggest that households, especially those saving paradoxically, have large (excess) holdings in deposits, we assume that financial advisors might encourage households to reduce their holdings in deposits. Moreover, we assume that financially literate households are aware of the negative returns on deposits in real terms and thus might have lower incentives to keep large holdings in deposits. To measure the extent to which these key variables reduce households' deposit holdings, we estimate a Tobit regression and model households' (conditional) holdings in deposits following an equation of the form:

$$\%DEPOSITS_i = \alpha + \beta_1 * FL_i + \beta_2 * FA_i + \gamma' c_i + \varepsilon_i \quad (3)$$

where FL_i and FA_i represent the main explanatory variables financial literacy and financial advice for a respective household i. c_i is a vector of control variables as in Equation (2). $\%DEPOSITS_i$ is the share of households' deposits divided by the total amount of financial assets.

[Please insert Table V about here.]

Table V reports the conditional marginal effects from a series of Tobit regressions. In column (1), we analyze the effects of our key variables on holdings in deposits for our full sample, whereas in columns (2) and (3), we restrict our sample to households that show excess liquidity of at least three and six months of monthly income, respectively.

With respect to financial literacy, conditional marginal effects in column (1) indicate that a one-unit increase in financial literacy is associated with a 6.5 percentage point decrease in deposit holdings. The respective sample mean for the share of deposits in column (1) equals approximately 50%. Hence, we calculate the conditional fraction of deposit holdings ($E(\%DEPOSITS \mid \%DEPOSITS > 0)$) as $\left(\frac{0.0649}{0.5010}\right) \cong 0.13$, indicating that, controlling for all other variables, a one-unit increase in financial literacy decreases households' conditional fraction of deposit holdings by roughly 13 percent. With respect to households carrying high excess liquidity in columns (2) and (3), we document that the effect of financial literacy remains relatively constant. This finding suggests that the impact of financial literacy on households' deposit holdings does not increase with higher excess deposit holdings.

Next, we assess whether financial advisors encourage households to decrease their deposit holdings. Our results suggest a sizeable negative (mitigating) effect of financial advice on households' deposit holdings in every specification. In particular, the conditional marginal effect of financial advice in column (1) indicates that advised households, on average, have 5.1 percentage points less financial wealth invested in deposits, indicating that advised households hold approximately 10.3 percent less financial wealth in deposits, compared to their unadvised counterparts. In contrast to our findings on financial literacy, the effect of financial advice increases in magnitude when we consider households with high excess liquidity in columns (2) and (3). This result suggests that financial advisors play an especially important role in decreasing households' deposit holdings for households that keep high excess liquidity.

4.2.b The effect on households' financial asset diversification

While the previous section suggests that financially literate households and those that received financial advice largely reduce their deposit holdings, we now pose the question of whether these households spread their freed-up resources among other asset classes beyond deposits. More precisely, we elaborate on the role of financial literacy and financial advice in households'

financial asset diversification among all available asset classes. To model the relationships among financial literacy, financial advice, control variables and households' decisions to diversify their financial assets, we use a series of OLS regressions following the equation of the form:

$$Diversification_i = \alpha + \beta_1 * FL_i + \beta_2 * FA_i + \gamma' c_i + \varepsilon_i \quad (4)$$

where FL_i and FA_i represent the key determinants financial literacy and financial advice for a respective household i. c_i is a vector of control variables as in Equation (2). $Diversification_i$ is a proxy for households' diversification among available asset classes (Shin et al., 2017) from Equation (1).

[Please insert Table VI about here.]

In Table VI, we the present results of an OLS regression using the regression framework from Equation (3).

With regard to households' financial literacy, we document that financially literate households show better diversified financial assets, which is in line with, for example Guiso and Jappelli (2008) and Goetzmann and Kumar (2008). In particular, the coefficient obtained from the OLS regression in column (1) indicates that a one-unit increase in financial literacy results in a 0.04 increase in households' financial asset diversification. Thus, a respondent with the lowest financial literacy level of zero shows 0.12 lower diversification than a respondent with the highest financial literacy level of three.

Finally, our results suggest that financial advisors play a pivotal role in households' financial asset diversification, which is in line with the findings of, for example Bluethgen et al. (2008). In particular, advised households show 0.09 higher diversification than their unadvised counterparts. This finding is particularly important because, while one could argue that financial advisors recommend unsuitable products for which they earn higher commissions (see, for example, Bhattacharya et al., 2012; Hackethal et al., 2012; Inderst and Ottaviani, 2009), we can provide some evidence that financial advisors nevertheless induce households to diversify their

assets among more asset classes. In so doing, our results suggest that financial advisors mitigate households' paradoxical savings behavior by reducing households' holdings in deposits, simultaneously diversifying the freed-up resources to other assets besides deposits.

4.3 Robustness Section

4.3.a Potential endogeneity of financial literacy

In this section, we consider whether the effect of financial literacy on paradoxical savings behavior in Table III is endogenous. Endogeneity of financial literacy possibly occurs due to reverse causality or omitted variables, such as the ability or motivation to think about financial topics (Bucher-Koenen and Lusardi, 2011). To these potential problems, one would ideally resort to a standard instrumental variable regression estimation (IV). Unfortunately, our data at hand do not contain appropriate instruments to perform a standard IV. However, recent studies have resorted to a method to perform instrumental variable regressions in the absence of external instruments using generated instruments after Lewbel (2012).[22] The approach proposed in Lewbel (2012) does not rely on the validity of the instruments similar to in standard IV regression. In contrast, it exploits variations in higher moment conditions of the error distribution from a first-stage regression of the likely endogenous covariate (i.e., financial literacy in our context) on other covariates in the model. Hence, we run a first-stage OLS regression featuring financial literacy as the dependent variable, including all of other control variables from our initial model in Equation (2). However, the model only generates valid instruments that can be used for identification if there is heteroscedasticity in the errors of the first-stage regression. In line with Deuflhard, Georgarakos, and Inderst (2017), we test this assumption by performing a Breusch-Pagan test for heteroscedasticity and find the assumption of heteroscedasticity to be

[22] For instance, Bannier and Schwarz (2017) and Deuflhard, Georgarakos, and Inderst (2017) both instrumentalized financial literacy using the generated instruments from Lewbel (2012).

strongly supported in our data.[23] Next, we generate instruments using the products of the residuals from the first-stage regression with each of the covariates, centered at their sample means.

[Please insert Table VII about here.]

In Table VII, we report the results for the second-stage estimates of a GMM linear probability model, using the method proposed in Lewbel (2012). Our results indicate that financial literacy continues to have negative (mitigating) and significant effects on paradoxical savings behavior. The exogeneity tests are rejected (*p*-value: 0.13), and Hansen's J-statistic for overidentifying restriction highly accepts the null hypothesis that the instruments are valid (*p*-value: 0.88).

4.3.b Controlling for observed and unobserved heterogeneity between advised and unadvised households

To establish causality between financial advice and the household savings paradox, we must consider potential selection bias due to receiving financial advice, because advised households can greatly differ in observable covariates compared to unadvised households, indicating that they show unequal (selection) probabilities of receiving financial advice. For instance, households that gain higher average income or that possess more wealth probably exhibit a greater propensity to consult advisors. To overcome this issue, we perform propensity score matching analysis (PSM) to account for the potential selection bias of households' likelihood of receiving financial advice. Propensity score matching analysis is a widely used technique to address selection concerns, with applications seen in, for instance, Agarwal, He, Sing, and Zhang (2016), Drucker and Puri (2005) and Lel and Miller (2015). Gerhardt and Hackethal (2009) also use PSM in the context of financial advice. Thus, we follow their approach and build a control sample of unadvised households that exhibit the same demographics as advised households by matching advised households with their unadvised socio-demographic 'twins'.

[23] The results of the Breusch-Pagan test (chi^2=249.48 with a *p*-value of 0.00) strongly support the assumption of heteroscedasticity in the first-stage regression.

In the first step of our PSM approach, we estimate a logistic regression featuring a financial advice dummy as the dependent variable, including all of the variables in Table II as control variables.[24] The results from the Logit regressions are reported in Table A2 in the appendix. Based on the propensity scores for receiving financial advice obtained from the Logit regression, we select our matched sample using a 1:1 nearest-neighbor matching approach without replacement and a caliper of 0.2 times the standard deviation of the logit of the propensity score (Austin, 2011).[25]

[Please insert Table VIII about here.]

In Panel A of Table VIII, we present the balance in covariates used in our analysis before and after matching. Results indicate that covariates are well balanced after matching, as all *t*-statistics are insignificant. In addition, we provide matching quality indicators in Panel B of Table VIII. All matching quality indicators suggest that the sample of treated (advised) and matched untreated (unadvised) households are very well balanced, and matching reduced the mean bias between treated and untreated households by 82.4%.[26]

[24] We select the variables to include in the PSM model based on the international literature on financial advice (see, for example, Bhattacharya et al., 2012; Gerhardt and Hackethal, 2009; Hackethal et al., 2012).

[25] In additional analyses, we build different matched samples using other matching techniques, such as nearest-neighbor (n=5), nearest-neighbor (n=10), and kernel-based matching (GAUSSIAN and EPANECHNIKOV). The results are robust to different matching methods and are available upon request.

[26] First, we provide the Pseudo R^2 from the logistic regression of the propensity score with corresponding *p*-values of the likelihood-ratio test of regressors' joint significance. Second, we provide Rubins' B as the absolute standardized difference of the means for the linear index of the propensity score in the treated and matched non-treated, and third, we provide Rubins' R as the ratio of treated to matched non-treated variances of the propensity score index (Rubin, 2001). Please note that Rubin (2001) recommended that B should be less than 25 and R should be between 0.5 and 2.0 so that samples can be considered appropriately balanced.

In the second step of our PSM analysis, we adopt the methodology of Andreou, Louca, and Petrou (2017) and Lel and Miller (2015) and re-estimate our main results from column (3) of Table III using the matched sample obtained from the PSM analysis in Table VIII.

[Please insert Table IX about here.]

In Table IX, we present the results of Probit regression using the matched sample obtained from Table VIII, featuring paradoxical savings behavior as the dependent variable. We include the same control variables as in our main model in column (3) of Table III. As can be inferred from the results in Table IX, the average marginal effects do not vary much in quantitative terms and are still highly statistically significant, indicating that our results are robust to potential selection bias based on distributional differences in observable covariates between advised and unadvised households.

While PSM analysis shows that the effect of financial advice on paradoxical savings behavior is largely free of selection bias based on observable covariates, PSM does address biases arising from unobserved variables. Since we use observational data, rather than a randomized experiment, our data might suffer from 'hidden bias' (i.e., endogeneity) due to unobserved (unmeasured) covariates that simultaneously affect the likelihood of receiving financial advice (i.e., the treatment) and financial behavior (i.e., the outcome). Although there are no tests to identify the existence of unobserved variables, there are tests that assess the magnitude of the effect that an unobserved variable would need to have on treatment and outcome variables to alter inferences about the observed treatment effect (DiPrete and Gangl, 2004; Rosenbaum, 2007). In this vein, we perform a sensitivity analysis using Rosenbaum bounds, which can be seen as a 'worst-case' scenario for average treatment effects on the treated in the presence of unobserved heterogeneity (i.e., 'hidden bias') between advised and unadvised households. Since our outcome variable is dichotomous, we follow Becker and Caliendo (2007) and calculate Mantel and Haenszel

(1959) test statistics, which provide bound estimates of significance levels given a certain degree of 'hidden bias'.

[Please insert Table X about here.]

Table X shows the results of our sensitivity analysis, where Γ indicates the size of 'hidden bias' in terms of the changes in the odds ratio for households' likelihood of being advised. In the presence of no 'hidden bias', Γ equals 1, whereas higher values of Γ indicate changes in households' odds ratio of being advised due to the influence of an unobserved variable. In addition, we calculate 'hidden bias equivalents' that illustrate the magnitude of Γ that would cause us to withdraw causality between financial advice and paradoxical savings behavior, expressed as equivalent effects of observed covariates from the Logit regression displayed in Table A2 (Bartram, Brown, and Conrad, 2011; DiPrete and Gangl, 2004; Peel and Makepeace, 2012). The results in Table X suggest that the effect of financial advice on paradoxical savings behavior is very robust to endogeneity caused by unobserved (confounding) variables. According to the test statistics from Mantel and Haenszel (1959), we would have to alter the effect of financial advice on paradoxical savings behavior at $\Gamma = 1.7$. This result indicates that the confidence interval for the effect of financial advice on paradoxical savings behavior would include zero if an unobserved variable caused the odds ratio of treatment assignment to differ between advised and unadvised households by 1.7 (or 70%) (DiPrete and Gangl, 2004). Moreover, this variable's effect on paradoxical savings behavior would have to be so strong as to almost perfectly determine whether the paradoxical savings behavior would be greater for the advised and unadvised households in each pair of matched cases in the data. In contrast, if an unobserved variable had an equally strong effect on the odds ratio of receiving financial advice but only a weak effect on paradoxical savings behavior, the confidence interval would not include zero. Hence, the Rosenbaum bounds can be considered a 'worst case' scenario. Expressed in economic terms (i.e., 'hidden bias equivalents), the influence of an unobserved variable that induces such a large

influence on households' odds ratio of receiving financial advice is comparable to a change in logged wealth and income of 5.4 and 4.2, which is the same effect as an increase in households' wealth (monthly income) of €178,449 (€1,666). Hence, the results indicate that the effect of financial advice on households' paradoxical savings behavior is very robust against potential endogeneity arising from unobserved heterogeneity between advised and unadvised households.

5 Conclusion

In this study, we present evidence of the previously unconsidered household savings paradox, which relates to households who refuse to invest in any other asset classes beyond deposits. Compared to the frequently documented nonparticipation in the stock market, these households also shun investments in comparable safe asset classes, such as contractual savings and retirement products. Thus, the household savings paradox largely extends previous findings on nonparticipation in the stock market. In general, we find paradoxical savings behavior to be a population-wide phenomenon that jeopardizes households' wealth accumulation, especially in the context of achieving long-term financial goals, such as sufficient retirement preparedness. Considering the increased responsibility for households' own financial well-being due to recent reforms in government pension systems resulting in reductions in state-granted retirement provisions, the consequences are severe for households' retirement planning (Bucher-Koenen and Lusardi, 2011; Lusardi and Mitchell, 2007). Nevertheless, contractual savings and retirement products can be considered more complex and less liquid than deposits (Börsch-Supan et al., 2012; Bucher-Koenen, 2009). Hence, households might need to possess sufficient financial literacy or obtain help from external information providers, such as financial advisors, to understand these financial products. Elaborating on the determinants of household savings paradox, we show that financial literacy and financial advice strongly decrease paradoxical savings behavior. In particular, we find that a one-unit increase in financial literacy decreases paradoxical savings behavior by 4.7 percentage points and households that received financial advice are

12.5 percentage points less likely to save paradoxically. Finally, we reveal a potential mechanism of how financial literacy and financial advice reduce paradoxical savings behavior, and we show that financially literate and advised households possess substantially lower deposit holdings and better diversify their financial resources among available asset classes. While financially literate individuals could profit from a better understanding of financial concepts, financial advisors might educate those that lack financial literacy and thus encourage them to invest in assets beyond deposits. These results are in favor of our initial hypothesis that financial literacy and financial advice can largely reduce households' perceived complexity of financial products. Thus, our findings are of the utmost importance for policymakers, and they suggest that increasing households' financial literacy is an inevitable necessity. Further, in contrast to studies solely focusing on the return performance of advised portfolios, our study provides a more general picture of the role of financial advice in households' sound financial decision-making. We find that financial advisors add considerable value to households' savings decisions, particularly by encouraging households to engage in asset classes that are usually likely to generate positive inflation-adjusted returns.

Limitations and implications for future research

Despite controlling for a broad variety of alternative explanations for paradoxical savings behavior, our study might not be free of limitations: First, as previously mentioned, our principal data (PHF) do not contain information about returns on the assets held by households. Thus, we are not able to directly assess the consequences of paradoxical savings behavior. Moreover, because we rely on cross-sectional data, we cannot control for specific market-timing aspects of households' investment behavior. Although this fact could potentially affect our results, additional data on households' aggregated returns in Figure 2 reveal that paradoxical savings behavior is indeed detrimental to households' wealth accumulation.

Second, throughout our study, we argue that financial literacy and financial advice positively contribute to households' financial decision-making because they reduce paradoxical savings behavior. However, in the sense of Guiso and Viviano (2015), it is often unclear whether a financial decision is good or bad because one cannot observe the optimal savings plan for the household. However, even although we lack information about households' optimal savings plan, we argue that households with excess liquidity should nevertheless diversify their available financial resources among other asset classes besides deposits.

Third, we assume the complexity of financial products to be a major determinant of households' paradoxical savings behavior. In this vein, we conjecture that financial advisors help households to understand more complex financial products, simultaneously raising awareness of those products. Although this explanation for why financial advice reduces the household savings paradox is reasonable, one could also argue that unadvised households save paradoxically because they mistrust financial institutions. For instance, advised households could potentially be less prone to the household saving paradox because financial advisors reduce these households' anxiety (Gennaiola, Shleifer, and Vishny, 2015) or elicit feelings of trust (Guiso, Sapienza, and Zingales, 2008). Clearly, this evidence creates another plausible rationalization for why individuals might refuse to invest in (more complex) products offered by financial institutions and why advised households are less prone to paradoxical savings behavior. Unfortunately, we lack the necessary data to test this conjecture and therefore must leave this analysis to future research in the field.

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Tables and Figures

Figure 1: Households' paradoxical savings behavior and wealth

This figure provides the proportion of households prone to paradoxical savings behavior among wealth groups. The data is weighted and representative for German households. Please note, that the average of the sum of quartiles 1 to 4 does not equal the total sample average ('All') due to the applied survey weights.

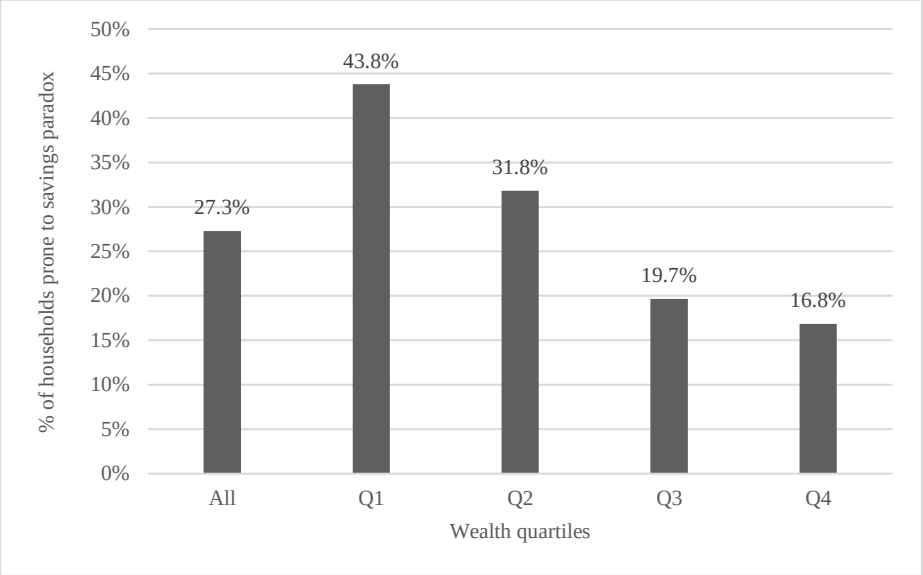

Figure 2: German households' inflation-adjusted returns by asset class

This figure provides an investment scenario covering the period between December 1996 and March 2017 using quarterly inflation-adjusted returns on various asset classes held by German investors. The data is weighted and representative for an average German household. For further information on weighting and calculation of the respective returns, please refer to Deutsche Bundesbank (2017a).

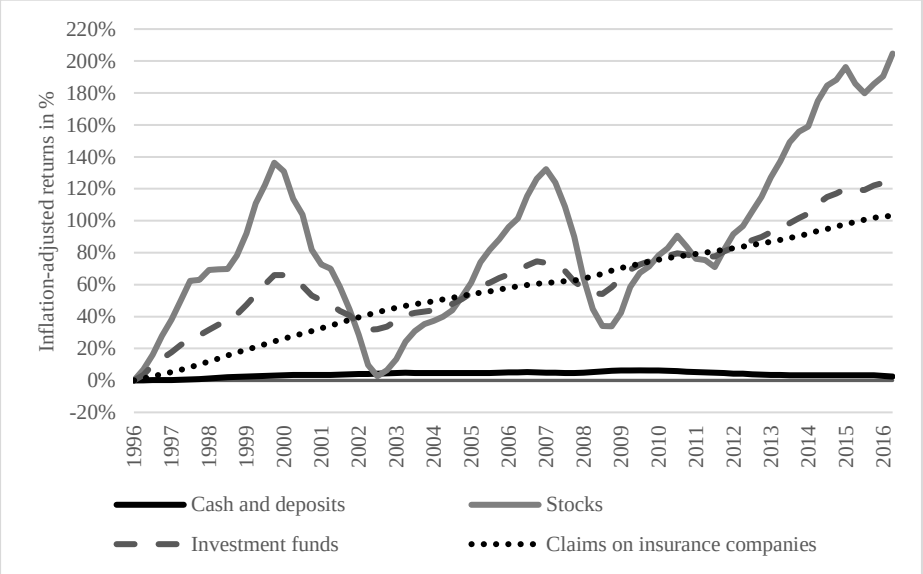

Figure 3: The household savings paradox: implications for households' financial asset diversification

This figure presents households' financial asset diversification among available asset classes distinguishing between paradoxical saving households and non-paradoxical savers. The dashed line shows the average financial asset diversification in our sample. We proxy for diversification using a recent diversification measure suited to household survey data as proposed by Shin, Seay, and Kim (2017). The data is weighted and representative for German households.

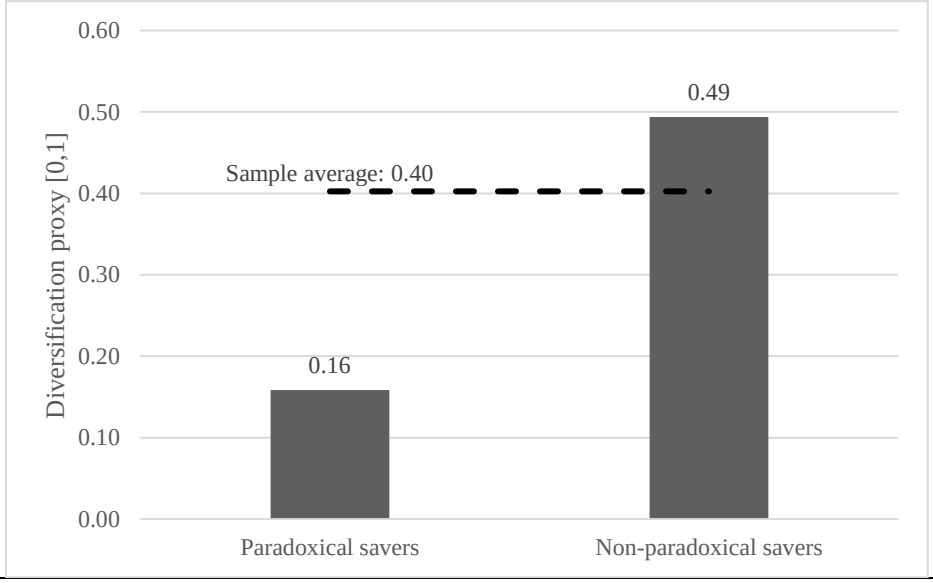

Table I: Savings and investment behavior in Germany

This table shows savings and investment behavior of German households (N = 3,353). Please note that we exclude households from our sample that do report to own any financial assets. The data is weighted and representative for the German population. For a detailed variable description, we refer to Table A1 in the appendix.

	German population	Amount of assets in €			
	N = 3,353				
Name	%	Mean	Me-dian	Std. dev	N
Risky Financial Assets	25.31%	48,740	15,000	172,429	1,160
Funds	18.71%	28,756	10,000	91,765	799
Stocks	12.00%	28,552	8,980	116,625	664
Bonds	6.12%	48,384	15,800	119,779	345
Other securities	2.61%	21,805	9,000	57,782	150
Contractual savings and retirement products	67.40%	37,655	14,517	73,875	2,259
State-subsidized private pension plans	54.17%	28,131	12,554	53,502	1,822
Endowment life insurances	30.97%	23,472	12,000	36,334	1,128
Building loan contracts	38.32%	7,499	3,700	13,928	1,288
Deposits	95.78%	20,226	7,000	41,266	3,235
Checking accounts	86.49%	3,632	1,500	8,460	2,930
Savings accounts	77.26%	21,007	8,000	42,568	2,688
Total financial assets		57,090	22,000	134,522	3,353

Table II: Summary statistics

This table reports summary statistics for all explanatory variables used in our analysis. The data is weighted and representative for the German population. We provide variable descriptions in Table A1 in the appendix.

	German population			
	Mean	Median	Std. dev	N
Financial literacy	2.494	3	0.722	3,293
Financial advice	0.272	0	0.445	3,082
Financial risk tolerance	1.404	1	0.555	3,352
Trust	5.485	5	2.068	3,346
Male	0.521	1	0.500	3,353
Married	0.517	1	0.500	3,353
Age	52.33	51	17.77	3,353
Education	0.555	0	0.853	3,353
Self-employed	0.069	0	0.254	3,353
Unemployed	0.034	0	0.181	3,353
Retired	0.326	0	0.469	3,353
Household net income	2,430	2,000	2,393	3,353
Household net wealth	169,090	50,000	477,997	3,353
Homeowner	0.444	0	0.497	3,353
Positive wealth shock	0.293	0	0.455	3,353
Save regularly	0.604	1	0.489	3,353

Table III: Determinants of the household savings paradox

This table reports results from a series of Probit regressions featuring paradoxical savings behavior as the dependent variable. Columns (1) to (3) show average marginal effects of the Probit estimates. In column (4), we report the coefficients of the Probit regressions. Tailor linearized standard errors are reported below the coefficients in parentheses. ***, **, * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	Dependent: Paradoxical savings behavior			
	(1)	(2)	(3)	(4)
Financial literacy	-0.0538***		-0.0468***	-0.1974***
	(0.0131)		(0.0133)	(0.0655)
Financial advice		-0.1340***	-0.1254***	-0.4639
		(0.0249)	(0.0247)	(0.3605)
(Financial literacy) x (financial advice)				-0.0345
				(0.1389)
Financial risk tolerance	-0.0613***	-0.0726***	-0.0698***	-0.3047***
	(0.0198)	(0.0205)	(0.0207)	(0.0915)
Trust	-0.0065	-0.0032	-0.0051	-0.0220
	(0.0046)	(0.0045)	(0.0046)	(0.0201)
Male	0.0080	0.0067	0.0121	0.0531
	(0.0193)	(0.0201)	(0.0199)	(0.0866)
Married	0.0421*	0.0465**	0.0348	0.1520
	(0.0225)	(0.0236)	(0.0230)	(0.1006)
Age	-0.0103***	-0.0103***	-0.0095**	-0.0414**
	(0.0037)	(0.0037)	(0.0038)	(0.0168)
Age^2	0.0001***	0.0001***	0.0001***	0.0006***
	(0.0000)	(0.0000)	(0.0000)	(0.0002)
Education	-0.0134	-0.0178	-0.0058	-0.0248
	(0.0113)	(0.0119)	(0.0118)	(0.0516)
Self-employed	0.0650*	0.0271	0.0365	0.1594
	(0.0361)	(0.0375)	(0.0375)	(0.1641)
Unemployed	0.0551	0.0270	0.0413	0.1823
	(0.0461)	(0.0508)	(0.0509)	(0.2220)
Retired	0.0827**	0.0866**	0.0872**	0.3795**
	(0.0335)	(0.0342)	(0.0344)	(0.1511)
Household net income (log)	-0.0873***	-0.0910***	-0.0839***	-0.3663***
	(0.0235)	(0.0247)	(0.0242)	(0.1069)
Household net wealth (log)	-0.0045***	-0.0039**	-0.0039**	-0.0170**
	(0.0015)	(0.0016)	(0.0016)	(0.0069)
Homeowner	-0.0745***	-0.0667***	-0.0645***	-0.2819***
	(0.0214)	(0.0226)	(0.0220)	(0.0957)
Positive wealth shock	-0.0444**	-0.0216	-0.0268	-0.1192
	(0.0222)	(0.0236)	(0.0234)	(0.1029)
Save regularly	-0.1040***	-0.0938***	-0.0837***	-0.3667***
	(0.0192)	(0.0201)	(0.0202)	(0.0885)
Observations	3,288	3,077	3,028	3,028
F-test	24.221	24.509	21.684	20.473
F-test *p*-value	0.000	0.000	0.000	0.000

Table IV: Paradoxical savings behavior: controlling for financial wealth, liquidity and retirement status and financial crisis effects

This table reports average marginal effects obtained from a series of Probit regressions featuring paradoxical savings behavior as the dependent variable. In column (1), we restrict our sample to households in the highest financial wealth quartile. Next in column (2), we restrict our sample to households with deposit holdings exceeding six months of their income. Column (3) presents a subsample analysis on households that are not yet retired and column (4) restricts our sample to households that do not experienced considerable wealth losses due to the financial crisis. Please note, that observations in subsample in column (1) are not equally distributed due to applied survey weights. Tailor linearized standard errors are reported below the coefficients in parentheses. ***, **, * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	Dependent: Paradoxical savings behavior			
	Financial wealth Q4	Excess liquidity	Non-retired households	Unaffected by financial crisis
	(1)	(2)	(3)	(4)
Financial literacy	-0.0270**	-0.0419**	-0.0342**	-0.0435***
	(0.0115)	(0.0207)	(0.0155)	(0.0139)
Financial advice	-0.0799***	-0.1605***	-0.0961***	-0.1180***
	(0.0217)	(0.0349)	(0.0296)	(0.0262)
Controls	Yes	Yes	Yes	Yes
Observations	1,102	1,166	1,914	2,587
F-test	5.377	10.588	11.355	19.489
F-test *p*-value	0.000	0.000	0.000	0.000

Table V: The effect of financial literacy and financial advice on households' holdings in deposits

This table reports conditional marginal effects obtained from a series of Tobit regressions featuring the holdings in deposits divided by the total amount of financial assets as the dependent variable. Tailor linearized standard errors are reported below the coefficients in parentheses. ***, **, * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	Dependent: Holdings in deposits divided by total financial assets		
	Total	Excess liquidity (3-month)	Excess liquidity (6-month)
	(1)	(2)	(3)
Financial literacy	-0.0649***	-0.0704***	-0.0783***
	(0.0141)	(0.0177)	(0.0219)
Financial advice	-0.0514***	-0.0982***	-0.1340***
	(0.0175)	(0.0242)	(0.0303)
Financial risk tolerance	-0.0742***	-0.0962***	-0.1047***
	(0.0169)	(0.0231)	(0.0293)
Trust	-0.0051	0.0085	0.0073
	(0.0049)	(0.0064)	(0.0078)
Male	0.0143	-0.0101	-0.0083
	(0.0184)	(0.0256)	(0.0316)
Married	-0.0002	0.0438	0.0640*
	(0.0213)	(0.0280)	(0.0336)
Age	-0.0196***	-0.0235***	-0.0203***
	(0.0040)	(0.0045)	(0.0056)
Age^2	0.0002***	0.0003***	0.0002***
	(0.0000)	(0.0000)	(0.0001)
Education	0.0084	0.0054	0.0056
	(0.0104)	(0.0137)	(0.0167)
Self-employed	-0.0176	-0.0569	-0.0897
	(0.0318)	(0.0435)	(0.0571)
Unemployed	0.0347	0.0090	0.0160
	(0.0577)	(0.1060)	(0.1269)
Retired	0.0928***	0.1239***	0.1232**
	(0.0360)	(0.0449)	(0.0537)
Household net income (log)	-0.0685***	-0.0942***	-0.0750**
	(0.0211)	(0.0265)	(0.0310)
Household net wealth (log)	-0.0017	-0.0151***	-0.0148***
	(0.0021)	(0.0044)	(0.0055)
Homeowner	-0.0076	0.0159	0.0010
	(0.0199)	(0.0281)	(0.0345)
Positive wealth shock	-0.0034	-0.0066	0.0031
	(0.0188)	(0.0255)	(0.0315)
Save regularly	-0.0067	-0.0035	0.0061
	(0.0219)	(0.0340)	(0.0425)
Observations	3,028	1,674	1,166
F-test	30.003	25.704	16.949
F-test *p*-value	0.000	0.000	0.000

Table VI: Households' financial asset diversification: the role of financial literacy and financial advice

This table reports coefficients obtained from an OLS regression featuring a proxy for households' financial asset diversification as the dependent variable. We proxy for diversification by using a novel measure in Shin et al. (2017): $Diversification_i = 1 - \sum_{j=1}^{J}\left(\frac{Amount\ invested\ in\ asset_{j,i}}{Total\ financial\ assets_i}\right)^2$, where j denotes the respective asset class and higher values indicate better diversified financial assets. Tailor linearized standard errors are reported below the coefficients in parentheses. ***, **, * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	Dependent: Households' financial asset diversification
Financial literacy	0.0367***
	(0.0086)
Financial advice	0.0865***
	(0.0121)
Financial risk tolerance	0.0262**
	(0.0113)
Trust	0.0030
	(0.0028)
Male	0.0008
	(0.0114)
Married	0.0005
	(0.0136)
Age	0.0043**
	(0.0021)
Age^2	-0.0001***
	(0.0000)
Education	0.0126*
	(0.0067)
Self-employed	-0.0127
	(0.0231)
Unemployed	-0.0472
	(0.0375)
Retired	-0.0338
	(0.0209)
Household net income (log)	0.0437***
	(0.0135)
Household net wealth (log)	0.0068***
	(0.0011)
Homeowner	0.0137
	(0.0137)
Inheritor	0.0177
	(0.0130)
Save regularly	0.0807***
	(0.0135)
Observations	3,025
R^2	0.295
F-test	41.167
F-test *p*-value	0.000

Table VII: IV regressions with generated instruments

This table presents second stage IV GMM linear probability model estimates of our baseline model in column (3) of Table III, instrumenting financial literacy using generated instruments after Lewbel (2012). Standard errors are robust. All data are weighted and representative for German households.

	Dependent: Paradoxical savings behavior
Financial literacy	-0.0829***
	(0.0243)
Controls	Yes
Observations	3,028
R^2	0.294
Endogeneity test (*p*-value)	0.127
Hansen J statistic (*p*-value)	0.882
F-test of excluded instruments	42.403
(*p*-value)	0.000

Table VIII: Propensity score matching analysis

Panel A of this table shows summary statistics for covariates used in our PSM analysis before and after matching. For each covariate, we run *t*-tests to test for the equality of means in the two-samples. Moreover, we calculate the % standardized bias, which is the difference of the sample means of the treated and non-treated as a percentage of the square root of the average of the sample variances in the treated and non-treated groups as proposed by Rosenbaum and Rubin (1985). In Panel B, we provide matching quality indicators to ensure that our matching approach rules out systematic differences in the distribution of covariates between treated (advised) and untreated (unadvised) households. Therefore, we provide Pseudo R^2 from logit estimation of propensity score with corresponding *p*-values of the likelihood-ratio test of the joint significance of all the regressors. In addition, we calculate Rubins' B, which is the absolute standardized difference of the means for the linear index of the propensity score in the treated and non-treated, and Rubins' R, which is the ratio of treated to non-treated variances of the propensity score index (Rubin, 2001). Displayed asterisk in Rubins' B indicates that absolute standardized difference of the means for linear index of the propensity score in the treated and untreated is greater than the critical value of 25 as proposed by Rubin (2001). ***, **, * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Panel A: Covariate means of control variables for advised and unadvised households

	Before matching				After matching			
	Advised	Unadvised	Standardized % bias	*t*-statistic	Advised	Unadvised	Standardized % bias	*t*-statistic
Financial literacy	2.617	2.565	8.00	2.02**	2.613	2.629	-2.50	-0.54
Financial risk tolerance	1.576	1.384	34.50	8.86***	1.503	1.484	3.40	0.72
Trust	5.627	5.394	11.60	2.93***	5.527	5.570	-2.20	-0.47
Male	0.584	0.553	6.10	1.57	0.575	0.590	-3.10	-0.64
Married	0.682	0.644	8.10	2.06**	0.675	0.700	-5.00	-1.05
Age	55.72	54.73	6.10	1.55	55.31	55.85	-3.30	-0.69
Age^2	3,366	3,263	5.80	1.49	3,318	3,368	-2.80	-0.59
Education	0.862	0.679	18.90	4.93***	0.796	0.795	0.20	0.05
Self-employed	0.087	0.096	-3.00	-0.75	0.094	0.103	-2.90	-0.57
Unemployed	0.021	0.031	-6.40	-1.59	0.019	0.015	2.20	0.56
Retired	0.397	0.354	8.90	2.28**	0.378	0.392	-2.90	-0.60
Household net income (log)	7.983	7.778	32.80	8.23***	7.932	7.955	-3.60	-0.81
Household net wealth (log)	11.710	9.465	43.90	10.09***	11.566	11.492	1.40	0.49
Homeowner	0.645	0.538	21.70	5.51***	0.634	0.660	-5.30	-1.12
Positive wealth shock	0.467	0.316	31.20	8.08***	0.416	0.423	-1.50	-0.30
Save regularly	0.771	0.612	34.90	8.68***	0.746	0.778	-7.00	-1.54

Panel B: Matching quality indicators

	Pseudo R^2	LR chi^2	$p>chi^2$	Mean Bias	Median Bias	Rubin's B	Rubin's R
Before matching	0.070	265.48	0.000	17.6	10.3	65.4*	0.48*
After matching	0.003	8.19	0.943	3.1	2.9	13.9	1.03

Table IX: Re-estimation of main results using matched samples

In this table, we re-estimate our main results from column (3) of Table III using the matched samples obtained from our PSM analysis. Tailor linearized standard errors are reported below the coefficients in parentheses. ***, **, * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	Dependent: Paradoxical savings behavior
Financial literacy	-0.0304**
	(0.0151)
Financial advice	-0.1053***
	(0.0223)
Controls	Yes
Observations	1,694
F-test	13.055
F-test *p*-value	0.000

Table X: Sensitivity analysis for unobserved heterogeneity between advised and unadvised households

This table reports results from our sensitivity analysis. We estimate Rosenbaum bounds for average treatment effects on the treated in the presence of unobserved heterogeneity ('hidden bias') between treatment and control cases. As our outcome variable is dichotomous, we use Mantel and Haenszel (1959) tests statistics that give bound estimates of significance levels at given levels of hidden bias (Γ), under the assumption of either systematic over- or underestimation of treatment effects. $\Gamma = 1$ indicates that selection into treatment is free of hidden bias. Q_{MH}^{+} and Q_{MH}^{-} show the Mantel and Haenszel (1959) tests statistics for the assumption of either overestimation or underestimation with corresponding *p*-values, respectively. In the two rightmost columns, we calculate 'hidden bias equivalents' (logged wealth and income), which are the implied changes in observable covariates at a given size of Γ that illustrate the equivalent magnitude of hidden bias that would cause us to revise our findings (DiPrete and Gangl, 2004). The 'hidden bias equivalents' are calculated as the product of the sample mean of the covariate times Γ.

	Dependent: Paradoxical savings behavior				Hidden bias equivalents	
Γ	Q_{MH}^{+}	Q_{MH}^{-}	P_{MH}^{+}	P_{MH}^{-}	Wealth (log)	Income (log)
1	5.673	5.673	0.000	0.000		
1.05	6.050	5.302	0.000	0.000	0.496	0.383
1.1	6.409	4.948	0.000	0.000	0.969	0.747
1.15	6.755	4.611	0.000	0.000	1.421	1.096
1.2	7.087	4.290	0.000	0.000	1.854	1.430
1.25	7.408	3.983	0.000	0.000	2.269	1.750
1.3	7.718	3.689	0.000	0.000	2.668	2.058
1.35	8.018	3.406	0.000	0.000	3.052	2.354
1.4	8.308	3.135	0.000	0.001	3.422	2.639
1.45	8.590	2.874	0.000	0.002	3.779	2.914
1.5	8.864	2.622	0.000	0.004	4.123	3.180
1.55	9.130	2.379	0.000	0.009	4.457	3.437
1.6	9.389	2.144	0.000	0.016	4.780	3.686
1.65	9.642	1.917	0.000	0.028	5.093	3.927
1.7	9.888	1.696	0.000	0.045	5.396	4.161
1.75	10.129	1.483	0.000	0.069	5.691	4.389
1.8	10.364	1.275	0.000	0.101	5.978	4.610
1.85	10.594	1.073	0.000	0.142	6.256	4.825
1.9	10.819	0.877	0.000	0.190	6.527	5.034
1.95	11.039	0.686	0.000	0.246	6.792	5.237
2	11.254	0.500	0.000	0.309	7.049	5.436

Appendix

Table A1:Variable descriptions

Name	Description
Age	Ordinal variable that contains head of household's age.
Financial advice	Dummy variable that equals one if the respondent received financial advice during the last three years, zero otherwise. Corresponding PHF item: *"Has your household used a consulting service at your principal bank in the past two years?" 1 - Yes; 2 - No.*
Financial literacy	Ordinal variable measuring the number of correct answers to financial literacy questions. Corresponding PHF items: *Question 1: Compound interest effect: "Let us assume that you have a balance of 100 EUR on your savings account. This balance bears interest at a rate of 2% per year and you leave it for 5 years on this account. How high do you think your balance will be after 5 years?" 1-More than 102 EUR [correct]; 2-Exactly 102 EUR; 3-Less than 102 EUR* *Question 2: Inflation: "Let us assume that your savings account bears interest at a rate of 1% per year and the rate of inflation is 2% per year. Do you think that in one year's time the balance on your savings account will be the same as, more than, or less than today?" 1-More than today; 2-The same as today; 3-Less than today [correct]* *Question 3: Diversification: "Do you agree with the following statement: 'Investing in shares of a company is less risky than investing in a fund containing shares of similar companies'?" 1-Agree; 2-Disagree [correct]*
Education	Ordinal variable that describes the respondent's highest degree of education/qualification: 1 - Higher education entrance; 2 - non-academic post-secondary education; 3 - University degree or higher. Zero otherwise.
Financial risk attitude	Ordinal variable that measures respondents' financial risk attitude on a scale from [1] - I am not ready to take any financial risks to [4] - I take significant risks and want to generate high returns.
Homeowner	Dummy variable that equals one if the household is homeowner, zero otherwise.
Household net income	Continuous variable measuring households' monthly income (EUR).
Household net wealth	Continuous variable measuring households' net wealth (EUR),
Male	Dummy variable that equals one if the respondent is male, zero for female.
Married	Dummy variable that equals one if the respondent is married, zero otherwise.
Positive wealth shock	Dummy variable that equals one if the respondent (or any other household member) has ever received a larger gift or inheritance, e.g. money or other valuables, from someone else who does not belong to the household, zero otherwise.
Retired	Dummy variable that equals one if the respondent is retired, zero otherwise.
Save regularly	Dummy variable that equals one if the household reports to save regularly each month, zero otherwise.
Self-employed	Dummy variable that equals one if the household is self-employed, zero otherwise.
Trust	Ordinal variable capturing respondents' general trust levels on a scale from [0] - I do not trust other at all, to [10] I trust others completely.
Unemployed	Dummy variable that equals one if the household is unemployed, zero otherwise.

Table A2: Logit estimation results used for propensity score analysis

This table reports results of a Logit regression featuring a dummy variable for financial advice as the dependent variable. ***, **, * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	Dependent: Financial advice
	Coeff.
Financial Literacy	0.0203
	(0.0655)
Financial risk tolerance	0.4254***
	(0.0769)
Trust	0.0303
	(0.0212)
Male	-0.0507
	(0.0863)
Married	-0.1171
	(0.1003)
Age	-0.0205
	(0.0168)
Age2	0.0001
	(0.0002)
Education	0.0261
	(0.0470)
Self-employed	-0.2733*
	(0.1509)
Unemployed	0.2988
	(0.2891)
Retired	0.3573**
	(0.1454)
Household net income (log)	0.1532*
	(0.0881)
Household net wealth (log)	0.0925***
	(0.0166)
Homeowner	-0.0314
	(0.1001)
Positive wealth shock	0.3868***
	(0.0870)
Save regularly	0.4977***
	(0.0972)
Observations	3,028
Wald Chi^2 test	266.877
Wald Chi^2 test *p*-value	0.000
Pseudo R^2	0.071