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THE ROLE OF FINANCIAL LITERACY AND MONEY EDUCATION ON WEALTH DECISIONS

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Abstract

We investigate the impact of financial education on a wide range of wealth decisions using Dutch data from the DNB Household Survey. We consider two indexes representative of basic and advanced financial literacy acquired when adults, and money education received from the family during adolescence. Advanced financial literacy is a significant determinant of all the wealth outcomes under examination, while basic financial literacy affects only the propensity to plan for retirement and the likelihood of holding debt. Studying the individual components of financial literacy, the most relevant effects are associated with the understanding of numeracy and inflation, together with the correct knowledge of market mechanisms. Interestingly, money education received from the family during adolescence is as important as advanced financial literacy to foster individuals' wealth decisions. We also find evidence of a gender gap, with males' wealth decisions more affected by higher levels of financial education. Our results highlight the importance of improving financial knowledge not only through proper educational programs when adults, but also in the family environment during adolescence, where teens can learn positive attitudes towards money that are maintained throughout their life.

JEL Classification: D14; I22; G41

Keywords: Financial literacy; Money education from family; Wealth decisions; Gender difference.

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1. Introduction

A growing strand of literature indicates that “more informed consumers are better consumers” (Hathaway and Khatiwada, 2008), as individuals with higher levels of financial education are more likely to participate in financial markets, invest in stocks, and plan for retirement, which is important to stimulate the accumulation of wealth (Christelis *et al.*, 2010; Van Rooij *et al.*, 2011; Alessie *et al.*, 2011). Overall, financial education is positively associated with many economic outcomes. However, financial literacy is very low in many countries, especially among women, the young, people living in rural areas, with low incomes and low educational attainments (Lusardi *et al.*, 2010; Lusardi and Mitchell, 2011). Improving the level of financial education is today a primary issue; that is why, in recent years, some governments have introduced financial literacy programs aimed to improve financial education.

In this paper, we investigate the relationship between financial education and a wide range of decisions such as retirement planning and wealth. We first consider two indexes representative of basic and advanced financial literacy acquired when adults, and then money education received from the family during adolescence. In particular, we answer the following four main research questions: (i) What is the relationship between basic and advanced financial literacy received when adults and wealth decisions? (ii) What components of financial literacy are more correlated with wealth decisions? (iii) Is money education received from the family during adolescence related to wealth decisions when adults, and how this effect compares with the effect of financial literacy? (iv) Are there any gender differences in the response of males and females to financial literacy and money education on wealth decisions?

We use 2005-2017 panel data from the DNB Household Survey including an additional module on financial literacy. Following Van Rooij *et al.* (2011) to measure objective financial knowledge, we create two financial literacy indexes (basic and advanced) from sixteen questions on financial topics included in the additional module. To measure money education, we consider the advice on money received from the family during adolescence.

This research contributes to the existing literature in four main directions. First, with the same dataset we assess whether financial literacy matters to explain a broader set of economic outcomes than what usually considered by the existing literature, which mostly focuses on stock holding (e.g., Christelis *et al.*, 2010; Van Rooij *et al.*, 2011) and retirement planning (e.g., Lusardi and Mitchell, 2007a, 2007b, 2008; Lusardi, 2009; Stango and Zinman,

2009; Alessie *et al.*, 2011). We look at individuals' saving, retirement planning, the size of financial assets, the separate ownership of safe or risky assets, and debt holding. Studying all these dimensions is important to assess whether and at what degree financial literacy stimulates several wealth decisions, or whether instead it influences some dimensions only.

Second, we contribute to the literature by investigating the role played by specific components of financial literacy in explaining wealth decisions. While the analysis of the overall indexes is important, disentangling the effect of each index component allows to identify what particular knowledge should be strengthened to improve specific wealth decisions.

Third, we enrich the existing literature on the role of financial education on wealth decisions by also investigating the role played by money education received during adolescence from the family. Money education is part of the process of financial socialization, by which individuals obtain “skills, information and attitudes to maximize their ability in the financial marketplace” (Ward, 1974). We consider teachings on money and saving received at age 12-16 from the family, as part of money education. We see this measure as another way of acquiring financial knowledge. Children's progress toward financial independence is also driven by parental teachings (Serido and Deenanath, 2016), with parents having strong influence on children's socialization and moral development – especially at young ages (Houser *et al.*, 2016). Whilst more knowledgeable individuals may have a clearer picture on how to handle their money, accumulating more wealth and avoiding taking up excessive debt, individuals who grew up learning the value of money may also develop positive attitudes toward saving, acquiring knowledge, values and attitudes on consumption that may be maintained throughout their life.

Lastly, we investigate whether the effects of financial literacy and money education on wealth decisions differ by gender. The existing literature documents a gender gap, with males on average more financially literate than females (Lusardi and Mitchell, 2008). This gap partly explains the observed difference in stock holding (Almenberg and Dreber, 2015). We study the gender gap on financial literacy as well as money education over several wealth decisions including risky asset holdings, saving, and retirement planning.

Our findings confirm previous results about the relevance of financial literacy in influencing financial decisions. In particular, we find that advanced financial literacy is positively correlated with the ownership of financial assets in general, and not only with stock holding; most importantly, advanced financial literacy increases the ability to manage financial resources and the propensity to plan for retirement. We also find that some

components of financial literacy are more significant than others in affecting wealth decisions: while the understanding of *numeracy* has a positive effect on saving, knowledge of *inflation* decreases the propensity to plan for retirement. Among the advanced literacy components, people more familiar with mutual funds and market mechanisms are more likely to have financial assets.

In addition, when both financial literacy received when adults and money education received from the family during adolescence are included in the analysis, we find that advanced financial literacy still plays a role in influencing our financial outcomes; however, the role played by money education received from the family during adolescence is as important as the role of advanced financial literacy in fostering financial choices of individuals. The ability to understand and correctly interpret financial topics affects financial decision-making and decisions about retirement (Lusardi and Mitchell, 2007a); however, we show that money education from the family is also effective in stimulating economic behavior maintained throughout life. This finding underlines the importance of the family as the primary socialization unit where children can learn values, beliefs and attitudes about money through the mechanism of “parent-child socialization” (Danes, 1994). However, we observe some gender differences, with financial literacy when adults generally larger among males, and money education during adolescence more widespread among females. Overall, males seem to be more affected than females by both types of financial education as regards wealth decisions.

The remainder of the paper is organized as follows: in Section 2, we present a review of the literature on financial literacy and family socialization, describing their effects on individuals’ financial decisions. In Section 3, we present the data, together with the variables that we use in our study and the summary statistics. Section 4 reports the econometric analysis and the results. In Section 5, we discuss our main findings and conclude.

2. Literature review

This study nests two streams of literature: the first one on financial literacy, and the second one on money education received from the family. We discuss them in Sub-sections 2.1 and 2.2, respectively.

2.1. Financial literacy

A growing body of literature emphasizes the crucial role of financial literacy in influencing investors' economic behavior. Financial literacy affects market participation, as individuals who are more financially literate display a greater propensity to invest in stocks (Christelis *et al.*, 2010; Van Rooij *et al.*, 2011) and are more likely to choose mutual funds with lower fees (Hastings and Tejada-Ashton, 2008). Financial literacy is also related to wealth accumulation and retirement decisions. Lusardi (2009) finds that a large share of Americans arrives close to retirement with little or no wealth. Lusardi and Mitchell (2007a) relate the lack in retirement planning to financial illiteracy. Similarly, Alessie *et al.* (2011) study the relationship between financial literacy and retirement planning among the Dutch population; according to their findings, individuals with low levels of financial literacy find it difficult to form expectations about future replacement rates and they do not know at what age to retire. Their study also shows the positive effect of financial knowledge on retirement planning, a finding that has also been emphasized by Stango and Zinman (2009). Moreover, respondents with more confidence in their financial knowledge exhibit higher propensity to plan for retirement (Lusardi and Mitchell, 2008). Planners display greater levels of patience and diligence in their economic behaviors; these factors are generally associated with having low discount rates, which contribute to increase saving and, in turn, retirement wealth (Lusardi and Mitchell, 2007b).

Van Rooij *et al.* (2011) investigate the relationship between financial literacy and households net worth and find a positive relationship between these two dimensions; consistent with this result, Behrman *et al.* (2012) show that financial literacy is positively and significantly associated with total net wealth. Stango and Zinman (2009) show that financial illiterate individuals are more likely to borrow and to accumulate lower amounts of wealth. However, whether financial literacy has a causal effect on financial choices is still an open question (Brugiavini *et al.*, 2015).

To measure financial literacy, Lusardi and Mitchell (2011) added an experimental module to several national surveys. The module includes three questions on interest compounding, the effects of inflation and risk diversification, which are now commonly used in the literature to assess individuals' financial knowledge. They find that many individuals lack the most basic economic concepts needed to make saving and investment decisions. The lack of financial literacy is widely documented in the United States (Bernheim, 1995) as well as in other countries including Australia, Japan, and many European countries (Lusardi and Mitchell, 2011), and particularly pronounced among women (Lusardi and Mitchell, 2008).

Hsu (2016) tries to motivate this gender gap, suggesting that women may be less interested than men on these topics. In addition, Lusardi and Mitchell (2011, 2014) find that financial literacy is higher for middle-age people, while older people tend to overstate their level of financial knowledge, compared to young respondents. Workers and people with higher educational attainments, especially in science and math, are generally more financially literate. Finally, people know more about inflation and risk diversification, if these have been experienced in their countries.

The generalized poor performance of citizens on financial literacy surveys conducted worldwide (Huston, 2011) has intensified the need for financial education; to address this issue, in recent years, several governments have established educational programs aimed to improve financial knowledge and most of them have shown to be effective (Otto and Webley, 2016; Sherraden *et al.*, 2009). For instance, Bernheim (2001) analyses a cross-sectional survey from the United States, and finds that secondary schools students, who were exposed to a financial educational program, increase the accumulation of assets over time.

2.2. Money education from the family

The role of financial literacy in supporting individuals' economic behavior during their life has long been recognized. However, the family also plays an important role in influencing individuals' financial behavior during childhood, through the mechanism of "parent-child socialization". According to Serido and Deenanath (2016), children's progress toward financial independence is driven by parental teachings, which are an informal source of financial education. Danes (1994) and Shim *et al.* (2010) find that the role of parents in predicting children's financial behavior is substantially larger than the role of peers and school; similarly, Sundarasan *et al.* (2016) find that money management of young adults is strongly influenced by parental norms.

There are different ways to introduce children to the value of money; according to Feather (1991), giving children a pocket money is a useful tool to grant them their own independence in the transition toward adulthood. Similarly, Fornero *et al.* (2016) investigate whether providing children a habit in managing pocket money could "generate a familiarity with good financial behaviors, like planning, which are maintained later in life"; in their research, they show the positive effect of pocket money on the "self-assessed" financial knowledge measured in adulthood. Buccioli and Veronesi (2014) study the effect of parental teaching strategies received during childhood on the propensity to save and the amount of money saved in the adult age; they find that young adults are more likely to accumulate

money if they received teachings on how to manage their wealth during childhood. The development of saving habits throughout life has also been investigated by Otto and Webley (2016); in a sample of British students, they find that those who have learned to budget during childhood become more autonomous in adult age and find it easier to save later on. Moreover, in a situation of income constraint, they are more likely to save by adjusting expenditure, rather than using other strategies to acquire money (i.e., working or asking parents additional money). Money education received in young age is also linked with some measures of future orientation; according to Bucciol and Zarri (2018), individuals who received teachings to save during childhood are more likely to evaluate the consequences of their behaviors on longer time periods.

However, to the best of our knowledge there are no studies comparing the effect of financial literacy received when adults and money education received from the family during adolescence. This work aims to fill this gap.

3. Data

We use longitudinal data from the DNB Household Survey (from now on, DHS), a household survey conducted annually since 1993 by CentERdata and sponsored by the Dutch National Bank. The DHS collects information about work, housing, economic situation, personal and psychological characteristics on a representative sample of the Dutch population. Occasionally, special modules on specific topics are added to the main survey.

In this analysis, we pay particular attention to the 2005 module on financial literacy (for details see Van Rooij *et al.*, 2011). The module contains sixteen questions meant to assess general understanding of financial topics. As in Van Rooij *et al.* (2011, 2012), we split the questions into basic and advanced literacy and perform two separate factor analyses on the two sets of questions (five and eleven, respectively) to build two indexes of basic and advanced literacy. See Appendix A.1 for details. Another important dimension in our study comes from two questions on the general questionnaire related to teachings received at age 12-16 from the family. The questions regard having received advice on how to budget and encouragement to save. As in Bucciol and Veronesi (2014), we combine the answers to these two last questions into one variable representing the advice on money management received in early life from parents or grandparents, which we label as a measure of “*money education from family*”. See Appendix A.2 for details.

We focus on the DHS waves since year 2005, as information about financial literacy was not available before, and we restrict our sample to adults older than 18. Our final sample consists of 1,018 respondents in charge of household finances for a total of 6,406 observations with complete information from the 2005-2017 waves of DHS.

3.1 Outcome variables

We consider six outcome variables related to wealth decisions, which are explained hereafter. Our first outcome of interest is *saving* defined as a dummy variable equal to one if the individual is able to save some money, and zero otherwise¹. According to Lopez *et al.* (2000), more educated investors are able to take better decisions about saving since they display greater knowledge of financial markets.

The second variable is *retirement planning*, which comes from the additional module on financial literacy; it is equal to one if the respondent states to have thought about retirement, and zero otherwise². Exploiting US survey data, Lusardi and Mitchell (2007a) find that thinking about retirement is strongly correlated with financial literacy. Their findings support the importance of improving financial education, a result that is particularly relevant also for the Netherlands. Indeed Alessie *et al.* (2011) find a positive effect of financial literacy on retirement planning in the Netherlands.

The third dependent variable used in our analysis is (the inverse hyperbolic sine of) *financial assets*. This variable considers the amount invested in safe assets (i.e., checking accounts, savings, deposit accounts, and saving certificates) and risky assets (i.e., stock and bonds, put/call options, insurance policies, and mortgage bonds) owned by the individuals. Financial assets are a measure of “money at hand”, whose values come from their contractual claims.

The remaining outcome variables used in our analysis are dummy variables representing assets holding. The variable *safe assets* is equal to one if the household holds checking accounts, deposits and other safe ways to invest money, and zero otherwise; the variable *risky assets* is equal to one if the household holds stocks, mutual funds, put or call options, and zero otherwise (as in Van Rooij *et al.*, 2011). The last variable in our analysis is called *debt*, and it is equal to one if the household has private loans (other than mortgages),

¹ The exact wording of the question is “How is the financial situation of your household at the moment?”. Our dummy variable is set to one if the answer is “some money is saved” or “a lot of money can be saved”.

² The exact wording of the question is “How much have you thought about your retirement?”. Our dummy variable is set to one if the answer is “a lot” or “some”.

extended lines of credit and outstanding debts, zero otherwise. As suggested by Lusardi and Tufano (2008), debt literacy is very low especially among women, the elderly and those with low income: this result is consistent with the evidence on financial knowledge. Interestingly, the authors find a strong relationship between debt literacy and debt loads; individuals without debt knowledge are more likely to borrow at a larger cost and to be involved in more expensive transactions. Their analysis suggests that a large share of the costs paid by investors is caused by their lack of financial knowledge.

3.2. Descriptive statistics

Table 1 provides descriptive statistics on the variables we use in our study. The average age in our sample is 58, about 38% are female, and the majority of the sample lives with a partner (67%). About 44% of respondents are employees, 58% have a high school diploma, and about 15% have college education. The average household net income is about 35,000 euros per year³. As regards financial education, the average level of basic financial literacy (0.89 out of 1) is statistically higher than that of advanced financial literacy (0.65).⁴ About 70% received advice on how to manage their money during adolescence. In our sample, about 58% are able to save some money, 72% have thought about retirement, most individuals invest in safe assets (about 89%) rather than in risky assets (26%), and about 14% have some debts. The average value of financial assets owned by an individual is about 50,000 euros.

TABLE 1 ABOUT HERE

4. Econometric analysis

We split the analysis into four parts. First, we investigate the relationship between basic and advanced financial literacy received when adults and our financial outcomes (Subsection 4.1). Second, we isolate specific components of financial literacy to investigate which component is more correlated with the financial measures considered in our analysis (Subsection 4.2). Third, we study whether money education received during adolescence from the

³ Monetary values are corrected for inflation and reported to 2015 prices using Dutch CPI index. Source: <http://stats.oecd.org/>. See Appendix A.5. for further information on the income variable.

⁴ Statistical t-test on the mean comparison: 72.223; p-value <0.01.

family is related to wealth decisions when adults, and how this effect compares with the effect of financial literacy (Sub-section 4.3). We conclude the section with a discussion of gender differences on the role played by financial literacy and money education on wealth decisions (Sub-section 4.4).

We estimate the following equation:

$$Y_{i,t} = \beta_0 + W_i\beta_1 + Z_{i,t}\beta_2 + X_{i,t}\beta_3 + F_{i,t}\beta_4 + \varepsilon_{i,t} \quad (1)$$

where $Y_{i,t}$ is a vector of dependent variables representing the financial outcomes of respondent i at time t ($t = 2005, \dots, 2017$) described in Section 3 such as saving, retirement planning, financial assets, safe assets, risky assets and debt; and $\varepsilon_{i,t}$ is an idiosyncratic error term. We include in our analysis four sets of explanatory variables, which can be grouped as follows:

- W_i is a vector of variables related to financial literacy received when adults and money education received from the family during adolescence. Its composition varies according to the specification we consider: it includes the two indexes of financial literacy (basic and advanced) in Sub-section 4.1; the raw components of financial literacy in Sub-section 4.2; and both the indexes of financial literacy and the dummy variable on whether individuals received money education at age 12-16 from their family in Sub-section 4.3. The variables are listed in Appendix A.1 and Appendix A.2.
- $Z_{i,t}$ includes variables on risk and time preferences; specifically, we consider individuals' risk aversion and their level of future orientation in taking financial decisions. We create these variables from six questions concerning taking risk and 12 statements about the future, respectively; interviewed people are asked to indicate whether they agree or not with these statements, on a scale from one to seven. The variables are listed in Appendix A.3 and Appendix A.4.
- $X_{i,t}$ is a vector of socio-demographic characteristics such as individuals' gender, age, education, marital status, employment, health status, household income and family composition.
- $F_{i,t}$ is a vector of year and geographic area fixed effects. It captures heterogeneity over space and over time, with the inclusion of region (North, South, East, West) and year dummy variables, respectively.

Our variables related to financial literacy do not change over time and are fixed to year 2005. This has two implications. First, we may expect in most cases financial literacy to increase with age and experience; therefore, our measures could be seen as a lower bound of the true level of financial literacy. Second, having time-invariant variables (on money education as well as financial literacy) prevents us from using a panel fixed-effect estimator. We therefore estimate random-effect regression models, incorporating a proxy for unit-specific effects by applying the Mundlak's approach (1978). This approach includes in the specification group-means of all the explanatory variables changing over time. This allows us to relax the assumption of zero correlation between the observed and the unobserved variables, which is required by the random-effect model.

However, our estimates could still suffer from reverse causality and from omitted variable bias. For example, financial literacy and our financial outcomes could be influenced by individuals' skills and financial experience: individuals learn more on financial topics when they are involved in financial decisions or when they start to plan for retirement (Alessie *et al.*, 2011). Given that we do not have information on these variables, our measures related to financial education may be endogenous. In addition, financial literacy is rather difficult to measure, also for potential measurement errors in financial variables (Van Rooij *et al.*, 2011), and our indexes are only proxy measures of the true financial literacy.

We address these concerns by using the instrumental variable (IV) method proposed by Lewbel (2012). This method allows to identify structural parameters in specifications with endogenous variables by creating instruments from the product between the exogenous variables included in the main model (in mean-centered form) and the residuals from a first-stage regression of the endogenous variables on the exogenous ones. In order to achieve the identification of the parameters, Lewbel's approach relies on two assumptions: i) errors from the first-stage regression are heteroskedastic; ii) the exogenous variables are uncorrelated with the product between errors from the main regression and errors from the first-stage regression. Assumption i) is strongly supported in our data according to a White test for heteroscedasticity (results available upon request); Assumption ii) is a relatively milder version of the exclusion restriction under standard IV, and is consistent with the finding of validity of the over-identifying restrictions. The Hansen over-identification test (whose p-value is shown in the output tables) supports this result in nearly all our regressions. The analyses reported in this section show Lewbel IV estimates; Appendix B presents random-effect estimates without instrumented variables.

4.1. Financial literacy, retirement planning and wealth

Table 2 presents Lewbel IV estimates on the effect of financial literacy measured by the two indexes of basic and advanced financial literacy on our outcomes of interest: *saving*, *retirement planning*, *financial assets*, *safe assets*, *risky assets* and *debt*. We find that basic financial literacy is significantly and positively correlated only with the likelihood of holding debt and weakly with retirement planning. Having basic financial knowledge is not enough to affect most of our financial outcomes; it may be equivalent to having “common sense” in financial decision-making. The weak effect of basic financial literacy is in line with evidence from Van Rooij *et al.* (2011).

Conversely, having advanced financial literacy affects significantly and positively financial assets and owning safe and risky assets while negatively holding debt. We also find a positive but weak effect of advanced financial literacy on the remaining outcomes: saving and retirement planning. The result on risky assets is consistent with the findings by Van Rooij *et al.* (2011). Risky assets usually provide greater returns, but they also present higher costs and volatilities; investors who deal with these financial instruments need deep understanding of the financial markets to properly manage the risk and to make efficient investment decisions. The result on debt holding is in line with Lusardi and Tufano (2008): individuals who are more financially knowledgeable are less willing to borrow excessively. It is also interesting to compare the coefficients of the two financial literacy indexes in the last specification (Column 6) of Table 2 on debt holding: respondents are more likely to have debts when they display high basic financial knowledge, whereas they are less likely to have debts when they show high advanced financial literacy. While these results differ from those by Almenberg *et al.* (2016), they are in line with findings by Lusardi and Tufano (2008), who suggest that people with the highest financial literacy are “more likely to report no problems with debt”. Individuals with more financial literacy may be able to manage their investments in a better way avoiding excessive borrowing and debt accumulation.

Other important predictors of some of our financial outcomes are the variables on risk aversion and future discounting. As expected, higher levels of risk aversion are associated positively and significantly with safe asset ownership and negatively with risky asset ownership. In addition, being more concerned about the future positively affects most of the financial outcomes. A higher degree of future orientation is associated with a better ability to save, to think about retirement, to have more accumulated financial assets, and to hold risky and (weakly) safe assets. Therefore, also time preferences play a role in describing people’s decision making; planning may reflect individual features as patience and diligence, which are

usually associated with a greater propensity to save (Lusardi and Mitchell, 2007b). Overall, results from Table 2 suggest the presence of a significant relationship between most of our financial outcomes and the index of advanced rather than basic financial literacy.

TABLE 2 ABOUT HERE

4.2. Specific components of financial literacy

In Table 3, we isolate the effect of specific components of financial literacy. Our specifications include dummy variables representing the correct answers to the raw financial literacy questions presented in Appendix A.1. Once we consider basic financial literacy, we find that the understanding of *numeracy* and *inflation* (*L1* and *L3*) are the most relevant components in terms of size and significance. For example, the correct answer to the question on interest rate (“*numeracy*”) increases the propensity to save by 10.4% and of holding debt by 7.7%, while knowledge of inflation has a negative effect (-8.4%) on retirement planning and a positive effect on holding debt (7.5%). It should be noted, however, that the most informed respondents on inflation are the retired ones, who during the 1970s experienced a period of high inflation; even if they correctly answer the question on inflation, at the time of the interview they have no more reasons to plan for retirement.

Among the advanced literacy components, the most relevant one is the awareness about the highest returns of stocks in the long run (*P4* – “*assets returns*”), compared to bonds and saving accounts. Financial investments over long-term periods offer more time to recover from potential losses; those who are knowledgeable about the higher returns and the lower volatilities of such investments opportunities will also be more inclined to participate in the financial markets (owning both safe and risky assets), as we can see from the correct answer to question *P4*. We also see that investors who understand bond prices (*P1*) are 8.4% more likely to invest in risky assets. In general, risky asset investment (Column 5) is the dimension in our analysis more highly correlated with components of advanced financial literacy.

TABLE 3 ABOUT HERE

4.3. Money education from family, retirement planning and wealth

In this sub-section, we investigate the association between having received money education during adolescence in the family environment and the outcomes retirement planning and wealth, and how this compare with the effect of financial literacy. Table 4

presents coefficient estimates of a model where we include both indexes of financial literacy (basic and advanced) and the variable “money education,” that is a dummy variable on having received teachings about money from the family at age 12-16.

The effect of money education is strong and statistically significant for all our financial dimensions, except for the propensity to invest in risky assets. Having received money education during adolescence increases the propensity to save when adults by 7.8% and of retirement planning by 9.6%; furthermore, it significantly increases the likelihood of holding safe assets by 3.9%. While money education is positively associated with all the outcomes in Columns 1-4, it has a negative impact on the probability of holding debt (Column 6). Given the finding by Buccioli and Veronesi (2014) that teaching strategies about money management during childhood have positive effects on the propensity to save and the amount saved when adults, we might expect that money education received from the family during adolescence decreases the propensity of holding debt.

We now compare the effect of having received money education received during adolescence with the effect of financial literacy received when adults. First of all, we notice that the coefficients on the financial literacy variables change little with respect to those in Table 2. Moreover, both advanced financial literacy and money education are in general significant determinants of wealth decisions. This suggests that they both provide concrete means by which individuals can foster their wealth decisions; financial literacy acquired through experience and formal education positively affects financial outcomes. However, having received money education at a young age is also an important factor affecting wealth decisions when adult.

Specifically, a respondent who was taught about money management from the family during adolescence is as likely to manage financial resources when adult as an individual who displays higher advanced financial literacy during adulthood, as measured by the coefficients on advanced financial literacy in Columns 1, 3, 4 and 6 of Table 4.⁵ If we compare the coefficients of money education and advanced financial literacy on the propensity to plan for retirement (Column 2), we find that the effect of money education during adolescence is significantly different than that of advanced financial literacy⁶; despite the propensity of thinking about retirement is positively influenced by both dimensions of financial education,

⁵ The difference between the coefficient on money education and the coefficient on advanced financial literacy is not statistically significant as the p-value associated to the Chi-squared test is equal to 0.109, 0.897, 0.260 and 0.335 in Columns 1, 2, 3, 4 and 6, respectively.

⁶ The difference between the two coefficients is statistically significant (p-value of the Chi-squared test: 0.083).

the effect of money education is significantly higher compared to that of financial literacy. People who grew up learning the value of money seem more likely to save, invest in safe assets and plan for retirement. The coefficient on money education is not significantly different from zero only on the “holding risky assets” variable. Conversely, investors who are more financially literate seem to prefer investing their money in a speculative way with the purpose of increasing their gains. Column 5 of Table 4 confirms these results and shows that the propensity of holding risky assets is only influenced by having advanced financial knowledge.

Overall, our findings show the importance of also considering money education received from the family at young age in analyzing wealth decisions; teaching adolescents to save is as important to improve wealth decision-making as providing financial literacy during adulthood.

TABLE 4 ABOUT HERE

4.4. Gender differences

We now enrich the models in Table 4 by making a distinction between males and females in the effects of financial literacy and money education on wealth decisions. In our data, males show significantly higher levels of basic and advanced financial literacy than females (in line with Lusardi and Mitchell, 2008), but lower levels of money education received from the family.⁷ This motivates our analysis, which indeed shows interesting findings. We report the key results in Table 5, where the variables on financial literacy and money education are interacted with gender, so that they measure the effects on males and females, separately.

First of all, it seems that most of the effects we found in previous analyses are driven by males rather than females. Indeed, financial literacy and money education are important determinants of wealth decisions for males, with sign and significance similar to those shown in Table 4; in general, the magnitude of the coefficients is also relatively higher than in Table 4, which suggests that our previous results, averaging the effects of males and females, compensate larger effects for males with smaller effects for females. Indeed, the female coefficients of Table 5 report a narrower set of effects: at the 5% level, we see that for females

⁷ We run t-tests on mean comparison. Basic financial literacy: 6.882; p-value <0.01; advanced financial literacy: 15.355; p-value <0.01; money education: 74.198; p-value <0.01.

advanced financial literacy is correlated only with financial assets and the holding of risky assets (positively), whereas money education with financial assets (positively) and debt holding (negatively). However, money education does not affect debt holding among males. In addition, we find that overall financial literacy and money education have similar effects by gender when focusing on financial assets and risky asset holding. Tests on the equality of the coefficients by gender reveal that the difference is significant in the case of money education with respect to saving, and of basic and advanced financial literacy with respect to debt holding. In both cases the effects are larger among males than females.

TABLE 5 ABOUT HERE

5. Conclusions

Similar to other studies (e.g., Alessie *et al.*, 2011; Van Rooij *et al.*, 2011), our findings underline positive relationships between financial literacy and the propensity to invest in risky assets and to plan for retirement; moreover, this study adds evidence about the role of financial literacy in determining new financial outcomes yet to be explored, and the role of money education received from the family during adolescence on wealth decisions.

We show that people more financially knowledgeable find it easier to manage their financial resources and exhibit better competence in wealth decisions, by reducing the amount of debt. Some components of financial literacy are more relevant than others: our financial outcomes are mainly correlated with the knowledge of *numeracy* and *inflation*, which are basic financial concepts. Among the advanced literacy components, people who are more familiar with mutual funds and market mechanisms are more likely to have financial assets; in particular, the propensity to hold risky assets is positively correlated with these variables.

In addition, we find that when both financial literacy received when adults and money education received from the family during adolescence are included in the analysis, they are both significantly correlated with wealth decisions. In particular, money education is as important as advanced financial literacy in stimulating individuals' wealth decisions. Financial literacy is generally larger among males, while money education is more widespread among females. However, the two types of financial education seem more effective among males in stimulating wealth decisions.

In our work, money education is defined as a set of teachings on money received within the family. However, there are different approaches on how family may influence

individuals' financial skills; for example, children might learn the value of money via observation and intent participation, rather than through communication and advices (Rogoff *et al.*, 2008). Matthies *et al.* (2012) find that parents contribute in fostering children's pro-environmental behavior by acting as social models; this might also apply for the development of positive financial attitudes.

We leave for future research the investigation of the effect of parents as role models on their children financial behavior later in life as the data in this analysis do not allow us to study it. Moreover, in line with Shim *et al.* (2010), we highlight the key role of the family in influencing individuals' financial decisions. However, school and peers are also important socialization factors which might affect children' consumption behavior (Varcoe *et al.*, 2001; Hayta, 2008); teachers are likely to affect financial attitudes of young people, as they are the main role models outside the family environment. Therefore, another direction for future research involves studying whether money education acquired from other socialization agents, most notably teachers at school, is as relevant as that from the family in predicting wealth decisions during adulthood.

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Table 1. Descriptive statistics

	Mean	Std. dev.	Min.	Max.
<i>Financial outcomes</i>				
Saving (<i>d</i>)	0.585	0.493	0	1
Retirement planning (<i>d</i>)	0.721	0.449	0	1
Financial assets	50,175.06	111,138.9	-97,660.84	3,642,061
Safe (<i>d</i>)	0.890	0.313	0	1
Risky (<i>d</i>)	0.258	0.438	0	1
Debt (<i>d</i>)	0.144	0.351	0	1
<i>Financial education</i>				
Basic financial literacy	0.891	0.191	0	1
Advanced financial literacy	0.651	0.286	0	1
Money education from family (<i>d</i>)	0.704	0.456	0	1
<i>Control variables</i>				
Risk averse	0.675	0.192	0	1
Future orientation	0.525	0.137	0	1
Female (<i>d</i>)	0.382	0.486	0	1
Age	58.299	13.668	24	90
With partner (<i>d</i>)	0.672	0.470	0	1
Household size -1	1.239	1.212	0	7
If children (<i>d</i>)	0.271	0.444	0	1
Employee (<i>d</i>)	0.441	0.496	0	1
Self-employed (<i>d</i>)	0.050	0.219	0	1
Retired (<i>d</i>)	0.325	0.468	0	1
High school (<i>d</i>)	0.583	0.493	0	1
College (<i>d</i>)	0.148	0.356	0	1
Income	35,382.39	40,698.36	161.858	2,560,580
Poor health (<i>d</i>)	0.248	0.432	0	1
<i>Notes:</i> The final sample includes 6,406 observations on 1,018 respondents interviewed between 2005 and 2017. (<i>d</i>) indicates that the variable is a dummy.				

Table 2. Financial literacy (Lewbel IV estimates)

Dependent variable	(1) Saving	(2) Retirement planning	(3) Financial assets	(4) Safe assets	(5) Risky assets	(6) Debt
<i>Basic financial literacy</i>	0.010 (0.013)	0.027* (0.016)	0.038 (0.111)	-0.000 (0.008)	0.011 (0.009)	0.029*** (0.008)
<i>Advanced financial literacy</i>	0.026* (0.016)	0.031* (0.018)	0.573*** (0.129)	0.020** (0.008)	0.086*** (0.012)	-0.028** (0.013)
Risk averse	0.037 (0.056)	-0.072 (0.059)	0.044 (0.415)	0.082*** (0.029)	-0.720*** (0.051)	-0.051 (0.048)
Future orientation	0.318*** (0.084)	0.588*** (0.090)	2.078*** (0.610)	0.080* (0.042)	0.279*** (0.069)	-0.071 (0.073)
Female	0.028 (0.028)	0.065** (0.032)	0.324 (0.229)	0.017 (0.015)	-0.007 (0.025)	-0.068*** (0.025)
Age/10	-0.062 (0.222)	-0.006 (0.254)	2.485 (2.063)	0.193 (0.144)	0.308 (0.204)	-0.088 (0.189)
(Age/10) ²	-0.004 (0.008)	0.011 (0.010)	-0.159** (0.081)	-0.009 (0.006)	-0.008 (0.008)	0.009 (0.007)
With partner	0.111*** (0.041)	0.047 (0.041)	0.331 (0.398)	-0.008 (0.031)	0.027 (0.035)	-0.063* (0.035)
Household size -1	-0.057** (0.026)	-0.002 (0.020)	-0.197 (0.222)	-0.004 (0.017)	-0.025 (0.024)	0.016 (0.021)
If children	-0.047 (0.058)	0.062 (0.054)	-0.121 (0.382)	-0.021 (0.031)	0.031 (0.049)	-0.018 (0.046)
Employee	0.178*** (0.043)	-0.067 (0.041)	0.325 (0.385)	0.014 (0.025)	0.054 (0.036)	-0.025 (0.033)
Self-employed	0.074 (0.072)	0.068 (0.078)	0.081 (0.579)	0.040 (0.038)	-0.018 (0.063)	-0.033 (0.076)
Retired	0.058 (0.048)	-0.060 (0.051)	0.420 (0.351)	0.039 (0.026)	0.007 (0.038)	0.019 (0.033)
High school	-0.066 (0.101)	0.036 (0.109)	-0.663 (0.684)	-0.074 (0.050)	0.133 (0.093)	0.001 (0.070)
College	-0.183 (0.180)	-0.014 (0.196)	-0.774 (1.227)	0.053 (0.077)	0.092 (0.193)	0.260 (0.173)
Income	0.058*** (0.014)	-0.011 (0.013)	0.114 (0.125)	-0.009 (0.010)	-0.013 (0.012)	-0.003 (0.010)
Poor health	0.009 (0.023)	0.036* (0.020)	-0.088 (0.190)	-0.016 (0.015)	-0.013 (0.020)	0.024 (0.018)
Constant	-2.680*** (0.548)	-1.983*** (0.602)	-8.587** (3.924)	0.683** (0.294)	-0.884* (0.524)	0.413 (0.469)
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Mundlak fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Weak identification F test	2.0e14	2.0e14	2.0e14	2.0e14	2.0e14	2.0e14
Hansen J test (p-value)	0.695	0.197	0.165	0.506	0.005	0.286
Avg. dependent variable	0.585	0.721	9.273	0.890	0.258	0.144
Number of respondents	1,018	1,018	1,018	1,018	1,018	1,018
Observations	6,406	6,406	6,406	6,406	6,406	6,406

Notes: The instrumented variables are in italics. Income and financial assets are transformed into inverse hyperbolic sine. Standard errors clustered at the respondent level are in parentheses. ***, **, * indicate significance at the 1%, 5%, and 10% level, respectively.

Table 3. Specific components of financial literacy (Lewbel IV estimates)

Dependent variable	(1) Saving	(2) Retirement planning	(3) Financial assets	(4) Safe assets	(5) Risky assets	(6) Debt
<i>Basic financial literacy</i>						
<i>[L1] Numeracy</i>	0.104* (0.057)	0.104 (0.068)	0.636 (0.427)	0.022 (0.031)	0.010 (0.043)	0.077** (0.031)
<i>[L2] Interest compounding</i>	-0.005 (0.032)	0.032 (0.040)	-0.010 (0.285)	0.010 (0.019)	0.016 (0.029)	0.019 (0.027)
<i>[L3] Inflation</i>	-0.045 (0.043)	-0.084* (0.048)	-0.180 (0.329)	-0.009 (0.025)	0.010 (0.027)	0.075** (0.031)
<i>[L4] Time value of money</i>	-0.027 (0.031)	0.068* (0.037)	-0.374 (0.235)	-0.039*** (0.015)	0.015 (0.024)	-0.031 (0.027)
<i>[L5] Money illusion</i>	0.010 (0.028)	-0.009 (0.029)	0.040 (0.203)	0.011 (0.014)	0.034 (0.023)	0.013 (0.020)
<i>Advanced financial literacy</i>						
<i>[D1] Stock market function</i>	0.048 (0.032)	0.037 (0.037)	-0.191 (0.238)	-0.002 (0.018)	-0.045* (0.026)	-0.049* (0.028)
<i>[D2] Stock meaning</i>	0.012 (0.028)	-0.022 (0.031)	0.324 (0.215)	0.004 (0.014)	0.036 (0.025)	-0.013 (0.021)
<i>[D3] Mutual funds</i>	-0.006 (0.033)	0.033 (0.039)	0.485* (0.264)	0.020 (0.019)	0.054* (0.028)	-0.019 (0.028)
<i>[D4] Bond meaning</i>	-0.007 (0.031)	0.003 (0.034)	0.278 (0.223)	0.013 (0.015)	0.020 (0.026)	-0.006 (0.026)
<i>[P1] Bond prices</i>	-0.012 (0.028)	0.014 (0.031)	0.182 (0.207)	-0.000 (0.014)	0.084*** (0.027)	-0.015 (0.023)
<i>[P2] Stock and fund risk</i>	0.013 (0.028)	-0.009 (0.031)	0.256 (0.216)	0.025* (0.014)	0.039 (0.024)	0.034 (0.021)
<i>[P3] Stock and bond risk</i>	0.050 (0.034)	-0.028 (0.039)	0.194 (0.251)	0.008 (0.017)	-0.018 (0.028)	-0.012 (0.027)
<i>[P4] Asset returns</i>	0.027 (0.028)	-0.006 (0.032)	0.611*** (0.205)	0.035** (0.014)	0.066*** (0.025)	-0.006 (0.021)
<i>[P5] Asset risk</i>	-0.024 (0.036)	0.043 (0.042)	0.068 (0.284)	-0.014 (0.019)	0.058* (0.030)	-0.033 (0.032)
<i>[P6] Diversification</i>	-0.001 (0.032)	0.028 (0.037)	0.100 (0.255)	-0.005 (0.017)	0.016 (0.026)	0.030 (0.024)
<i>[P7] Bond functioning</i>	0.008 (0.028)	0.041 (0.031)	-0.116 (0.209)	-0.006 (0.014)	0.024 (0.027)	-0.007 (0.024)
Socio-demographic controls	Yes	Yes	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Mundlak fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Weak identification F test	8.4e12	8.4e12	8.4e12	8.4e12	8.4e12	8.4e12
Hansen J test (p-value)	0.451	0.888	0.590	0.709	0.591	0.917
Avg. dependent variable	0.585	0.721	9.273	0.890	0.258	0.144
Number of respondents	1,018	1,018	1,018	1,018	1,018	1,018
Observations	6,406	6,406	6,406	6,406	6,406	6,406

Notes: The instrumented variables are in italics. Socio-demographic controls include the same control variables as in Table 2. Standard errors clustered at the respondent level are in parentheses. ***, **, * indicate significance at the 1%, 5%, and 10% level, respectively.

Table 4. Financial literacy and money education (Lewbel IV estimates)

Dependent variable	(1) Saving	(2) Retirement planning	(3) Financial assets	(4) Safe assets	(5) Risky assets	(6) Debt
<i>Basic financial literacy</i>	0.011 (0.014)	0.029* (0.016)	0.047 (0.111)	0.001 (0.008)	0.011 (0.009)	0.028*** (0.008)
<i>Advanced financial literacy</i>	0.027* (0.016)	0.032* (0.018)	0.581*** (0.129)	0.021** (0.008)	0.087*** (0.012)	-0.029** (0.013)
<i>Money education from family</i>	0.078*** (0.028)	0.096*** (0.030)	0.612*** (0.197)	0.039*** (0.014)	0.020 (0.023)	-0.053** (0.022)
Socio-demographic controls	Yes	Yes	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Mundlak fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Weak identification F test	5.3e13	5.3e13	5.3e13	5.3e13	5.3e13	5.3e13
Hansen J test (p-value)	0.496	0.404	0.252	0.602	0.023	0.747
Avg. dependent variable	0.585	0.721	9.273	0.890	0.258	0.144
Number of respondents	1,018	1,018	1,018	1,018	1,018	1,018
Observations	6,406	6,406	6,406	6,406	6,406	6,406

Notes: The instrumented variables are in italics. Socio-demographic controls include the same control variables as in Table 2. Standard errors clustered at the respondent level are in parentheses. ***, **, * indicate significance at the 1%, 5%, and 10% level, respectively.

Table 5. Financial literacy and money education by gender (Lewbel IV estimates)

Dependent variable	(1) Saving	(2) Retirement planning	(3) Financial assets	(4) Safe assets	(5) Risky assets	(6) Debt
<i>Basic financial literacy</i> <i>(Males)</i>	0.007 (0.019)	0.022 (0.023)	-0.056 (0.175)	-0.006 (0.011)	0.017 (0.014)	0.046*** (0.014)
<i>Advanced financial literacy</i> <i>(Males)</i>	0.044** (0.021)	0.051** (0.022)	0.773*** (0.203)	0.028** (0.013)	0.098*** (0.016)	-0.056*** (0.020)
<i>Money education from family</i> <i>(Males)</i>	0.128*** (0.036)	0.101*** (0.037)	0.598** (0.234)	0.038** (0.016)	0.044 (0.032)	-0.048 (0.030)
<i>Basic financial literacy</i> <i>(Females)</i>	0.012 (0.018)	0.033* (0.020)	0.131 (0.138)	0.006 (0.011)	0.003 (0.011)	0.012 (0.008)
<i>Advanced financial literacy</i> <i>(Females)</i>	0.011 (0.021)	0.008 (0.026)	0.346** (0.141)	0.013 (0.010)	0.073*** (0.016)	0.004 (0.013)
<i>Money education from family</i> <i>(Females)</i>	-0.005 (0.043)	0.095* (0.052)	0.722** (0.333)	0.043* (0.023)	-0.017 (0.032)	-0.074** (0.031)
Socio-demographic controls	Yes	Yes	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Mundlak fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Test by gender: Basic fin. lit.	[0.844]	[0.711]	[0.396]	[0.447]	[0.445]	[0.033]
Test by gender: Adv. fin. lit.	[0.267]	[0.191]	[0.083]	[0.349]	[0.264]	[0.009]
Test by gender: Money educ.	[0.017]	[0.921]	[0.757]	[0.877]	[0.166]	[0.543]
Weak identification F test	2.2e14	2.2e14	2.2e14	2.2e14	2.2e14	2.2e14
Hansen J test (p-value)	0.484	0.112	0.245	0.623	0.173	0.979
Avg. dependent variable	0.585	0.721	9.273	0.890	0.258	0.144
Number of respondents	1,018	1,018	1,018	1,018	1,018	1,018
Observations	6,406	6,406	6,406	6,406	6,406	6,406

Notes: The instrumented variables are in italics. Socio-demographic controls include the same control variables as in Table 2. Standard errors clustered at the respondent level are in parentheses; p-values are in squared parentheses. ***, **, * indicate significance at the 1%, 5%, and 10% level, respectively.

**THE ROLE OF FINANCIAL LITERACY
AND MONEY EDUCATION
ON WEALTH DECISIONS**

APPENDIX

– Not for Publication –

A.1. Financial literacy questions

The survey questions are divided in two blocks, “basic” literacy (questions L1-L5) and “advanced” literacy (questions D1-D4 and P1-P7); correct answers are in bold. Each question also allows “Do not know” and “Refuse” as possible answers. We create two indexes from factor analysis, separately from the two blocks of variables as in Van Rooij *et al.* (2011). The two indexes are then scaled in the 0-1 range.

“[L1] Suppose you had €100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow: more than €102, exactly €102, less than €102?”

- a) More than €102**
- b) Exactly €102
- c) Less than €102

[L2] Suppose you had €100 in a savings account and the interest rate is 20% per year and you never withdraw money or interest payments. After 5 years, how much would you have on this account in total?

- a) More than €200**
- b) Exactly €200
- c) Less than €200

[L3] Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, would you be able to buy more than, exactly the same as, or less than today with the money in this account?

- a) More than today
- b) Exactly the same as today
- c) Less than today**

[L4] Assume a friend inherits €10,000 today and his sibling inherits €10,000 3 years from now. Who is richer because of the inheritance?

- a) My friend**
- b) His sibling
- c) They are equally rich

[L5] Suppose that in the year 2010, your income has doubled and prices of all goods have doubled too. In 2010, will you be able to buy more, the same or less than today with your income?

- a) Buy more than today
- b) Buy the same as today**
- c) Buy less than today

[D1] Which of the following statements describes the main function of the stock market?

- a) The stock market helps to predict stock earnings
- b) The stock market results in an increase in the price of stocks
- c) The stock market brings people who want to buy stocks together with those who want to sell stocks**
- d) None of the above

[D2] Which of the following statements is correct? If somebody buys the stock of firm B in the stock market

- a) He owns a part of firm B**
- b) He has lent money to firm B
- c) He is liable for firm B's debts
- d) None of the above

[D3] Which of the following statements is correct?

- a) Once one invests in a mutual fund, one cannot withdraw the money in the first year
- b) Mutual funds can invest in several assets, for example invest in both stocks and bonds**
- c) Mutual funds pay a guaranteed rate of return which depends on their past performance
- d) None of the above

[D4] Which of the following statements is correct? If somebody buys a bond of firm B:

- a) He owns a part of firm B
- b) He has lent money to firm B**
- c) He is liable for firm B's debts
- d) None of the above

[P1] If the interest rates fall, what should happen to bond prices?

- a) They should rise**
- b) They should fall

c) They should stay the same

[P2] Do you think that the following statement is true or false? Buying a company stock usually provides a safer return than a stock mutual fund.

a) True

b) False

[P3] Do you think that the following statement is true or false? Stocks are normally riskier than bonds.

a) True

b) False

[P4] Considering a long time period (for example 10 or 20 years), which asset described below normally gives the highest return: Savings accounts, Bonds or Stocks?

a) Savings accounts

b) Bonds

c) Stocks

[P5] Normally, which asset described below display the highest fluctuations over time: Savings accounts, Bonds or Stocks?

a) Savings accounts

b) Bonds

c) Stocks

[P6] When an investor spreads his money among different assets, does the risk of losing money increase, decrease or stay the same?

a) Increase

b) Decrease

c) Stay the same

[P7] Is the following statement true or false? If you buy a 10-year bond, it means you cannot sell it after 5 years without incurring a major penalty

a) True

b) False

A.2. Money education from family

We consider the following two questions related to the experience with money during adolescence to measure money education from the family. We define the dummy variable *money education from family* equal to one if the answer to at least one question is either a) or b), zero otherwise. We combine the two questions as in Buccioli and Veronesi (2014) because statements may be easily confounded and overlapped by the respondents.

“*[Budget]* Did your (grand)parents try to teach you how to budget when you were between 12 and 16 years of age?”

- a) Yes, they gave me advice and practical help
- b) Yes, they gave me some advice and practical help
- c) Yes, but to a certain extent
- d) No

[Encouragement] Did your (grand)parents stimulate you to save money between the age of 12 and 16?”

- a) Yes, they emphasized the necessity of saving
- b) Yes, they told me how important saving is
- c) Yes, but to a certain extent
- d) No, not at all”

A.3. Risk preferences

We create the index *risk averse* by using factor analysis, separately by wave, after reverse-coding the variables SPAAR3, SPAAR5, and SPAAR6. This approach is taken from Kapteyn and Teppa (2011) and Bucciol and Miniaci (2018). The index is then scaled in the 0-1 range.

“To what extent do you agree with the following statements?

Please indicate on a scale from 1 to 7 to what extent you agree with the statement.

1 means ‘totally disagree’; 7 means ‘totally agree’.

[SPAAR1] I think it is more important to have safe investments and guaranteed returns, than to take a risk to have a chance to get the highest possible returns

[SPAAR2] I do not invest in shares, because I find this too risky

[SPAAR3] If I think an investment will be profitable, I am prepared to borrow money to make this investment

[SPAAR4] I want to be certain that my investments are safe

[SPAAR5] If I want to improve my financial position, I should take financial risks

[SPAAR6] I am prepared to take the risk to lose money, when there is also a chance to gain money”

A.4. Time preferences

The statements in the following questions belong to the “Consideration of Future consequences” scale developed by Strathman *et al.* (1994). Accordingly, we create the index *future orientation* by adding the answer to the questions, after reverse-coding TOEK03, TOEK04, TOEK05, TOEK09, TOEK10, TOEK11 and TOEK12. The index is then rescaled in the 0-1 range.

“To what extent do you agree with the following statements?

Please indicate on a scale from 1 to 7 to what extent you agree with the following statements.

1 means ‘extremely uncharacteristic’; 7 means ‘extremely characteristic’.

[TOEK01] I think about how things can change in the future, and try to influence those things in my everyday life

[TOEK02] I often work on things that will only pay off in a couple of years

[TOEK03] I am only concerned about the present, because I trust that things will work themselves out in the future

[TOEK04] With everything I do, I am only concerned about the immediate consequences (say a period of a couple of days or weeks)

[TOEK05] Whether something is convenient for me or not, to a large extent determines the decisions that I take or the actions that I undertake

[TOEK06] I am willing to sacrifice my well-being in the present to achieve certain goals in the future

[TOEK07] I think it is important to take warnings about negative consequences of my acts seriously, even if these negative consequences would only occur in the distant future

[TOEK08] I think it is more important to work on things that have important consequences in the future, than to work on things that have immediate but less important consequences

[TOEK09] In general, I ignore warnings about future problems because I think these problems will be solved before they get critical

[TOEK10] I think there is no need to sacrifice things now for problems that lie in the future, because it will always be possible to solve these future problems later

[TOEK11] I only respond to urgent problems, trusting that problems that come up later can be solved in a later stage

[TOEK12] I find it more important to do work that gives short-term results, than work where the consequences are not apparent until later”

It should be noticed that the DHS includes some auxiliary variables for routing purposes; since year 2000, due to the presence of “routing variable 7” in the section “Economic and Psychological Concepts”, statements about saving, risk taking and the future are answered only by respondents with a total household net income greater than or equal to 10,000 euros per year. Since year 2009 questions about the future are only asked if respondents did not fill them out in the previous waves. As a result, the inclusion of variables on risk aversion and future discounting determines a reduction in the number of observations used in our analysis.

A.5. Income

The DHS provides information about several income components and a measure of net personal income, which is the aggregation of total gross income, alimonies for children or spouse, scholarships or study loans, inheritance and rent subsidies minus income tax. Consistently with Van Rooij *et al.* (2011), in our analysis we consider net disposable income at household level. When this information is missing, we replace it with the amount of net income or with the central value of net income category indicated by the respondent, both expressed at the household level. Values are then corrected for inflation and reported to 2015 prices using Dutch CPI index.

B. Random-effect estimates (without instruments)

Table A.1. Financial literacy (Random-effect estimates)

Dependent variable	(1) Saving	(2) Retirement planning	(3) Financial assets	(4) Safe assets	(5) Risky assets	(6) Debt
Basic financial literacy	0.015 (0.012)	0.019 (0.014)	0.169 (0.119)	0.009 (0.009)	0.004 (0.009)	0.024*** (0.008)
Advanced financial literacy	0.036** (0.014)	0.053*** (0.016)	0.535*** (0.123)	0.018** (0.009)	0.092*** (0.010)	-0.015 (0.011)
Risk averse	0.021 (0.039)	-0.002 (0.030)	0.108 (0.339)	0.049* (0.029)	-0.316*** (0.034)	-0.018 (0.028)
Future orientation	0.098 (0.061)	0.054 (0.044)	1.125** (0.499)	0.044 (0.039)	0.083* (0.048)	0.062 (0.044)
Female	0.025 (0.026)	0.036 (0.030)	0.234 (0.234)	0.015 (0.017)	-0.031 (0.023)	-0.048** (0.022)
Age/10	0.060 (0.203)	-0.186 (0.237)	1.946 (2.017)	0.211 (0.153)	0.203 (0.187)	-0.089 (0.167)
(Age/10) ²	-0.006 (0.007)	0.023** (0.010)	-0.097 (0.076)	-0.005 (0.006)	-0.007 (0.008)	0.012* (0.006)
With partner	0.089** (0.036)	0.008 (0.027)	0.059 (0.455)	-0.028 (0.033)	-0.018 (0.025)	-0.059** (0.028)
Household size -1	-0.056** (0.024)	0.012 (0.013)	-0.185 (0.223)	-0.004 (0.018)	-0.003 (0.021)	0.015 (0.012)
If children	-0.004 (0.047)	0.050 (0.036)	0.116 (0.344)	-0.025 (0.030)	0.007 (0.038)	-0.020 (0.031)
Employee	0.172*** (0.040)	-0.030 (0.024)	0.478* (0.289)	0.021 (0.020)	0.032 (0.028)	-0.025 (0.025)
Self-employed	0.060 (0.060)	-0.005 (0.056)	-0.016 (0.567)	0.037 (0.038)	-0.023 (0.058)	0.081 (0.053)
Retired	0.047 (0.038)	-0.013 (0.035)	0.753** (0.306)	0.053** (0.024)	0.027 (0.030)	0.022 (0.024)
High school	-0.035 (0.061)	0.012 (0.022)	0.007 (0.795)	-0.018 (0.067)	0.097 (0.069)	0.138** (0.059)
College	-0.154 (0.136)	-0.048 (0.066)	-0.383 (1.052)	0.040 (0.074)	0.143 (0.091)	0.257** (0.101)
Income	0.043*** (0.011)	-0.009 (0.008)	0.116 (0.117)	-0.005 (0.010)	-0.007 (0.009)	0.001 (0.007)
Poor health	0.010 (0.017)	0.014 (0.014)	-0.054 (0.173)	-0.012 (0.014)	0.000 (0.017)	0.021 (0.014)
Constant	-2.639*** (0.527)	-1.601*** (0.572)	-9.498** (4.709)	0.462 (0.342)	-1.112** (0.471)	0.664 (0.433)
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Mundlak fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.143	0.092	0.138	0.054	0.224	0.047
Avg. dependent variable	0.585	0.721	9.273	0.890	0.258	0.144
Number of respondents	1,018	1,018	1,018	1,018	1,018	1,018
Observations	6,406	6,406	6,406	6,406	6,406	6,406

Notes: Income and financial assets are transformed into inverse hyperbolic sine. Standard errors clustered at the respondent level are in parentheses. ***, **, * indicate significance at the 1%, 5%, and 10% level, respectively.

Table A.2. Specific components of financial literacy (Random-effect estimates)

Dependent variable	(1) Saving	(2) Retirement planning	(3) Financial assets	(4) Safe assets	(5) Risky assets	(6) Debt
<i>Basic financial literacy</i>						
[L1] Numeracy	0.066 (0.054)	0.037 (0.061)	0.728 (0.494)	0.035 (0.037)	-0.024 (0.042)	0.052* (0.031)
[L2] Interest compounding	0.023 (0.030)	0.032 (0.038)	0.270 (0.302)	0.027 (0.022)	0.029 (0.025)	0.017 (0.024)
[L3] Inflation	-0.013 (0.041)	-0.031 (0.048)	0.014 (0.364)	0.002 (0.029)	0.015 (0.024)	0.061** (0.030)
[L4] Time value of money	-0.004 (0.029)	0.052 (0.034)	-0.303 (0.249)	-0.031* (0.018)	0.011 (0.024)	-0.018 (0.024)
[L5] Money illusion	-0.002 (0.026)	0.001 (0.029)	0.144 (0.223)	0.014 (0.016)	0.031 (0.022)	0.015 (0.019)
<i>Advanced financial literacy</i>						
[D1] Stock market function	0.037 (0.030)	0.039 (0.036)	-0.159 (0.264)	-0.002 (0.021)	-0.029 (0.024)	-0.043* (0.026)
[D2] Stock meaning	0.021 (0.026)	-0.008 (0.031)	0.130 (0.224)	-0.012 (0.017)	0.030 (0.023)	-0.002 (0.020)
[D3] Mutual funds	0.008 (0.031)	0.020 (0.038)	0.417 (0.289)	0.021 (0.022)	0.040 (0.025)	-0.035 (0.027)
[D4] Bond meaning	0.001 (0.029)	0.015 (0.033)	0.287 (0.242)	0.019 (0.018)	0.023 (0.024)	0.013 (0.024)
[P1] Bond prices	-0.008 (0.027)	0.024 (0.031)	0.096 (0.228)	-0.006 (0.017)	0.095*** (0.027)	-0.002 (0.021)
[P2] Stock and fund risk	0.008 (0.026)	0.006 (0.030)	0.314 (0.229)	0.031* (0.016)	0.032 (0.023)	0.030 (0.020)
[P3] Stock and bond risk	0.058* (0.032)	0.005 (0.037)	0.183 (0.272)	0.003 (0.021)	0.012 (0.025)	-0.007 (0.026)
[P4] Asset returns	0.027 (0.027)	0.020 (0.032)	0.766*** (0.220)	0.043*** (0.016)	0.096*** (0.023)	-0.008 (0.020)
[P5] Asset risk	-0.021 (0.033)	0.030 (0.040)	-0.054 (0.307)	-0.023 (0.023)	0.034 (0.026)	-0.029 (0.029)
[P6] Diversification	-0.005 (0.030)	0.015 (0.035)	-0.004 (0.265)	-0.009 (0.020)	-0.017 (0.025)	0.046** (0.023)
[P7] Bond functioning	0.004 (0.027)	0.036 (0.031)	0.010 (0.241)	0.003 (0.017)	0.033 (0.026)	-0.011 (0.022)
Socio-demographic controls	Yes	Yes	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Mundlak fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.149	0.099	0.143	0.059	0.236	0.054
Avg. dependent variable	0.585	0.721	9.273	0.890	0.258	0.144
Number of respondents	1,018	1,018	1,018	1,018	1,018	1,018
Observations	6,406	6,406	6,406	6,406	6,406	6,406

Notes: Socio-demographic controls include the same control variables as in Table A.1. Standard errors clustered at the respondent level are in parentheses. ***, **, * indicate significance at the 1%, 5%, and 10% level, respectively.

Table A.3. Financial literacy and money education (Random-effect estimates)

Dependent variable	(1) Saving	(2) Retirement planning	(3) Financial assets	(4) Safe assets	(5) Risky assets	(6) Debt
Basic financial literacy	0.016 (0.012)	0.020 (0.014)	0.181 (0.119)	0.010 (0.009)	0.004 (0.009)	0.023*** (0.008)
Advanced financial literacy	0.035** (0.014)	0.051*** (0.016)	0.525*** (0.123)	0.017* (0.009)	0.091*** (0.010)	-0.015 (0.011)
Money education from family	0.072*** (0.026)	0.102*** (0.029)	0.856*** (0.217)	0.060*** (0.016)	0.008 (0.022)	-0.059*** (0.020)
Socio-demographic controls	Yes	Yes	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Mundlak fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.148	0.104	0.142	0.057	0.225	0.052
Avg. dependent variable	0.585	0.721	9.273	0.890	0.258	0.144
Number of respondents	1,018	1,018	1,018	1,018	1,018	1,018
Observations	6,406	6,406	6,406	6,406	6,406	6,406

Notes: Socio-demographic controls include the same control variables as in Table A.1. Standard errors clustered at the respondent level are in parentheses. ***, **, * indicate significance at the 1%, 5%, and 10% level, respectively.

Table A.4. Financial literacy and money education by gender (Random-effect estimates)

Dependent variable	(1) Saving	(2) Retirement planning	(3) Financial assets	(4) Safe assets	(5) Risky assets	(6) Debt
Basic financial literacy (Males)	0.019 (0.018)	0.020 (0.020)	0.144 (0.185)	0.004 (0.012)	0.008 (0.014)	0.032** (0.013)
Advanced financial literacy (Males)	0.046** (0.019)	0.064*** (0.020)	0.715*** (0.180)	0.024* (0.012)	0.113*** (0.015)	-0.031* (0.016)
Money education from family (Males)	0.117*** (0.033)	0.117*** (0.036)	0.852*** (0.270)	0.055*** (0.019)	0.018 (0.031)	-0.049* (0.027)
Basic financial literacy (Females)	0.011 (0.016)	0.018 (0.019)	0.199 (0.150)	0.016 (0.013)	-0.001 (0.011)	0.016 (0.010)
Advanced financial literacy (Females)	0.024 (0.020)	0.037 (0.023)	0.293* (0.153)	0.010 (0.012)	0.064*** (0.013)	0.005 (0.013)
Money education from family (Females)	0.003 (0.040)	0.082* (0.047)	0.911*** (0.353)	0.071** (0.028)	-0.003 (0.028)	-0.081** (0.031)
Socio-demographic controls	Yes	Yes	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Mundlak fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Test by gender: Basic fin. lit.	[0.761]	[0.957]	[0.813]	[0.532]	[0.589]	[0.331]
Test by gender: Adv. fin. lit.	[0.425]	[0.359]	[0.066]	[0.397]	[0.012]	[0.081]
Test by gender: Money educ.	[0.028]	[0.563]	[0.895]	[0.641]	[0.613]	[0.443]
R-squared	0.152	0.105	0.144	0.058	0.226	0.056
Avg. dependent variable	0.585	0.721	9.273	0.890	0.258	0.144
Number of respondents	1,018	1,018	1,018	1,018	1,018	1,018
Observations	6,406	6,406	6,406	6,406	6,406	6,406

Notes: Socio-demographic controls include the same control variables as in Table A.1. Standard errors clustered at the respondent level are in round parentheses; p-values are in squared parentheses. ***, **, * indicate significance at the 1%, 5%, and 10% level, respectively.