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Financial Education and Households' Economic Decisions

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Introduction

This doctoral thesis is a collection of three empirical essays which explore the underlying factors affecting households' financial decisions. We perform our analyses using three different datasets under the light of three different perspectives. We first look at several wealth decisions that can be critical to households' financial wellbeing. We then explore the relationship between financial knowledge, financial satisfaction and attitudes towards cheating. We further investigate new potential determinants of saving behavior. Overall, the studies illustrated in the following chapters underline one common finding: financial education plays a key role in determining economic decisions.

The first chapter, titled "The Role of Financial Literacy and Money Education on Wealth Decisions" is a joint work with Alessandro Bucciol and Marcella Veronesi. In this research we investigate the relationship between financial education and a wide range of wealth outcomes including retirement planning and portfolio allocation. We consider two specific channels of financial education: basic and advanced financial literacy acquired when adults, and money education received from the family during adolescence. We use panel data from the Dutch DNB Household Survey and from an additional module on financial literacy. Our findings indicate that advanced financial literacy is positively correlated with stock holding and with the ownership of financial assets. When money education received from the family during adolescence is included in the analysis, we find that it also plays an important, though different, role in explaining financial decisions. In particular, money education is more likely to be associated with safer investments. In addition, we observe some gender differences, with males more affected than females by both types of financial education as regards wealth decisions. 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.

The second chapter, which is titled "Does financial satisfaction affect attitudes towards cheating?" is a joint work with Viola Angelini, on which I worked during my visiting at the Faculty of Economics and Business of the University of Groningen. In this research we study potential determinants of individuals' attitudes towards dishonesty using Dutch data from the Longitudinal Internet Studies for the Social Sciences panel. We consider both dishonesty towards the government, such as benefits fraud or tax evasion, and other forms of unethical behavior, such as fare evasion, property stealing and bribery. We focus on financial satisfaction, defined as satisfaction with one's present financial situation, as a relevant factor affecting cheating attitudes.

We rely on the role of financial literacy in influencing individuals' financial satisfaction to estimate the causal effect of financial wellbeing on consumers' misbehaviors. Our findings indicate that the financial satisfaction is a significant determinant of cheating towards the government. By contrast, an improvement in financial satisfaction does not make individuals less likely to justify stealing property and fare evasion: these components of cheating are mainly affected by personal characteristics and attitudes towards money. Most importantly, we find a strong and significant role of risk aversion in reducing the acceptability of these unethical actions. Interestingly, we find that both financial satisfaction and risk aversion are significant drivers of tolerance towards bribery. Therefore, decisions to behave dishonestly do not result only from financial advantages: financial satisfaction and risk aversion have different and independent impacts on individuals' tolerance towards dishonesty.

The third chapter, "Saving behavior: Financial Socialization and Self-Control" focuses on a specific dimension of financial behavior: saving decisions. In doing our research we use novel household data from the National Financial Well-Being Survey for the United States. We look at financial socialization, measured as exposure during adolescence to financial concepts across different dimensions, including discussions with family about financial issues, teachings from parents on how to be smart shoppers and experiential learning through allowances or saving accounts. We hypothesize that financial socialization affects saving behavior as well as personal self-control. Thus, we conduct a mediation analysis to decompose the effect of financial socialization on saving habits into a direct and an indirect component through self-control. We further analyze the effect of financial socialization and self-control on the decisions to save through specific financial products, such as checking accounts, educational loans, insurances, retirement accounts and financial assets, in a multivariate framework. Finally, we explore how financial socialization and self-control are related with the decisions to transfer money automatically into retirement and non-retirement saving accounts. Our results show that financial socialization does not only have a direct positive effect on the probability of saving money as a regular habit, but also an indirect positive one by means of increasing self-control. However, the relevance of financial socialization depends on the type of financial product being examined. Specifically, people who received financial education at home, either through teachings about money or by direct exposure to financial instruments, are more likely to hold safe financial assets like insurances or retirement accounts. Interestingly, we find that both financial socialization and self-control are significantly and positively related with the decision to automatically transfer money to savings accounts. Overall, we provide evidence of a strong association between financial socialization, self-control and saving behavior.

Chapter 1

THE ROLE OF FINANCIAL LITERACY AND MONEY EDUCATION ON WEALTH DECISIONS

Abstract

We investigate the relationship between financial education and a wide range of wealth decisions using DNB Household Survey data and a recent approach proposed by Lewbel (2012). We consider two channels of financial education: basic and advanced financial literacy acquired during adulthood, and money education received from the family during adolescence. We find that advanced financial literacy positively affects the ownership of financial and risky assets, whereas money education and the propensity to invest in risky assets and holding debt are negatively related. We also find evidence of a gender gap, with males' wealth decisions more affected by higher levels of financial literacy. Overall, our results highlight the complementarity between the two channels, with financial literacy increasing the propensity to invest in risky assets and money education in safer assets. Our findings underline the importance of acquiring financial education 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.

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.*, 2011a, 2011b; Alessie *et al.*, 2011). Overall, financial education is positively associated with many economic outcomes. However, the level of financial education is 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; this is why, in recent years, governments have introduced programs aimed to improve financial education.

In this paper, we investigate the relationship between two specific channels of financial education (financial literacy and money education) and a wide range of wealth decisions such as retirement planning and portfolio allocation.

We use 2005-2017 panel data from the Dutch DNB Household Survey including an additional module on financial literacy. Following Van Rooij *et al.* (2011b) to measure financial literacy, we create two indexes (basic and advanced financial literacy) from sixteen questions on financial topics included in the additional module. We use these indexes in our analysis to capture individuals' objective knowledge of financial concepts. Following Bucciol and Veronesi (2014) to measure money education, we consider teachings on saving received from the family during adolescence. The money education variable provides information about the role of parental education in stimulating a good economic behavior throughout life.

We expect both financial literacy and money education to correlate with saving and the accumulation of wealth, but through two different channels: by means of investment in riskier assets (financial literacy) or safer assets (money education). As regards the first dimension, financial decisions require the capacity to operate with new products and services which are available on the present economic environment. Individuals who are more financially knowledgeable may find it easier to deal with complex financial instruments and handle risky assets, as through financial literacy they develop greater skills at managing money. On the other hand, money education at young age may affect time preferences, elevating individuals' focus on financial planning and on the achievement of future savings goals (Lührmann *et al.*, 2018). We consider parents as instrumental in influencing children's awareness about the importance of money, as well as their propensity to protect themselves against future financial losses. For this

reason, individuals who received money education at young age may be more willing to choose safer investments assets later in life.

In particular, we ask the following three main research questions: (i) What is the relationship between wealth decisions and financial literacy? (ii) Is money education received from the family during adolescence related to wealth decisions when adults, and how does this effect compare with the effect of financial literacy? (iii) Are there any gender differences in the response of males and females to financial literacy and money education on wealth decisions?

This research contributes to the existing literature in three main directions. First, we identify the association between financial literacy, money education and a wide set of wealth outcomes using a recent approach developed by Lewbel (2012). We consider the fact that financial education may not be exogenous to wealth outcomes, and so that estimates can be biased due to omitted variables and reverse causality. Given the well-known difficulty of finding reliable instruments for financial education, the implementation of the Lewbel's approach is particularly valuable in this type of analysis. By using this approach, we compare our findings with those from the existing literature, which mostly exploits standard instruments to address the endogeneity of financial literacy.[1] We use Lewbel's approach to investigate the relationship between financial literacy and a broad set of wealth outcomes. 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 at the same time is important to provide additional evidence on the effect of financial education across several wealth decisions, as well as assessing the dimensions on which this effect is more relevant.

Second, we contribute to the literature by comparing for the first time the role of financial literacy in shaping financial decisions with the role of 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. The positive effects of money education may partially derive from building better financial knowledge, which in turn stimulates better financial decisions during adulthood. However, children's progress toward financial independence is also directly 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,

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[1] See Fernandes *et al.* (2014) and Lusardi and Mitchell (2014) for a review of the studies on the causal effect of financial education on financial behavior, along with the instruments used in the empirical analysis.

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. Thus, it seems plausible that our measure of money education directly affects respondents' financial attitudes, aspirations and behavior, rather than their willingness to learn financial concepts.

Third, 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 show that advanced financial literacy positively affects the ownership of financial and risky assets, whereas money education received from the family during adolescence plays a different role in explaining financial decision. In particular, we find a negative correlation between money education and the propensity to invest in risky assets and holding debts when adults.

Overall, our results highlight the complementarity between the two channels, with financial literacy increasing the propensity to invest in risky assets and money education in safer assets. Our results also underline the importance of acquiring financial education 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.

The remainder of the paper is organized as follows: Section 2 presents a review of the literature on financial literacy and family socialization, describing their effects on individuals' financial decisions. Section 3 describes the data we use in our study and the summary statistics, together with the research hypotheses. Section 4 reports the econometric analysis and the results. Section 5 discusses our main findings and concludes.

2. Literature review

This study nests two streams of literature, on financial literacy and 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, and especially stock holding (e.g., Christelis *et al.*, 2010; Van Rooij *et al.*, 2011b) and retirement planning (e.g., Lusardi and Mitchell, 2007a, 2007b, 2008; Lusardi, 2009; Stango and Zinman, 2009; Alessie *et al.,* 2011). 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.*, 2011b) and are more likely to choose mutual funds with lower fees (Hastings and Tejeda-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.* (2011b) 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. In the United States, Brown *et al.* (2016) investigate the impact of educational reforms aimed at increasing financial literacy on debt behavior of young people. In the decade after completing high school, students exposed to the reforms appear to improve debt savvy, in that they increase the prevalence of credit reports without increasing reliance on nonstudent debt. The relationship between financial literacy and debt-related outcomes has also been investigated by Stango and Zinman (2009), who show that financially illiterate individuals are more likely to borrow and to accumulate lower amounts of wealth.

Despite the rapid growth of interest in issues surrounding financial literacy, rigorous evidence of the impact of financial education remains scant in developing countries, where people are highly exposed to heavy shocks without having proper insurance or mitigation instruments (Kaiser and Menkhoff, 2017). Notable exceptions include Cole *et al.* (2011) and Sayinzoga *et al.* (2016). In particular, Sayinzoga *et al.* (2016) investigate the impact of an intensive one-week

training on financial behavior of a sample of Rwandan smallholders and find a positive effect of the intervention on savings. Moreover, the financial training induces non-borrowing farmers to take up loans and enhances the start-up of new income-generating activities. Their results strongly motivate providing financial literacy as an effective policy for targeting individual financial behavior.

Improving financial education may also be beneficial at the macro level. Grohmann *et al.* (2018) examine the link between financial literacy and financial inclusion in a cross-country setting, which allows to control for several institutional and financial characteristics. Their results document a significant and positive effect of financial literacy on financial inclusion, measured as access to and use of financial services; in turn, better financial inclusion could be an important instrument of financial development. However, whether financial literacy has a causal effect on financial choices is still an open question (Brown *et al.*, 2016; Brugiavini *et al.*, 2019).

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, 2010) 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, 2015; Sherraden *et al.*, 2009). For instance, Bernheim *et al.* (2001) analyses a cross-sectional survey from the United States, and find that secondary schools students, who were exposed to a financial educational program, increase the accumulation of assets over time. Similarly, Lührmann *et al.* (2015) examine the impact of a short financial education program on teenagers in German high schools and show that the training significantly increases their interest in, and knowledge of,

financial matters, especially their ability to properly assess the riskiness of assets. However, a recent meta-analysis conducted by Fernandes *et al.* (2014) reveals that interventions to improve financial literacy explain only a small part of the variance in financial behaviors. The effects of financial literacy interventions are even weaker in low-income samples and decay over time. In a similar work, Kaiser and Menkhoff (2017) show that the effectiveness of financial education is influenced by the peculiarities of the specific intervention, notably the characteristics of the target group. Indeed, financial education interventions are less effective for low-income clients as well as in low and lower-middle income economies, possibly because of the disadvantageous institutional circumstances in these countries. Additionally, Miller *et al.* (2015) argue that financial education interventions have a positive impact in such outcomes where individuals have the ability to exert greater control, including savings and record keeping, but do less well in preventing negative outcomes such as loan defaults.

2.2. Money education from 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 other socialization agents, including peers and school; consistent with these results, Sundarasen *et al.* (2016) find that money management of young adults is strongly influenced by parental norms. Similar findings are also reported by Mimura *et al.* (2015): among college students, those who describe their parents as an important source of financial information generally exhibit better financial practices.

There are different ways to introduce children to the value of money; parents actively influence their children to make better decisions either through practical teachings or through parental communication. According to Feather (1991), giving children some pocket money is a useful tool to grant them their own independence in the transition toward adulthood. Similarly, Fornero *et al.* (2018) 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. In further support of such discussions, parental socialization has been shown to predict positive financial mental outcomes like controllability and

efficacy, which in turn are associated with healthy financial behaviors (Shim *et al.*, 2015). Parental socialization may also vary by gender: for example, Gutter *et al.* (2010) investigate a national sample of emerging adults in college and find that females discuss with their parents about money more often than do young males, and therefore they are more strongly influenced by their parents.

Bucciol and Veronesi (2014) study the effect of different 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. In a different sample, Brown and Taylor (2016) examine the economic behavior of individuals over time and find that having saved as a child is positively associated with the probability of saving, as well as the amount saved on a regular basis, during early adulthood. The development of saving habits throughout life has also been investigated by Otto and Webley (2015); 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 expenditures, 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 (2019), individuals who received teachings to save during childhood are more likely to evaluate the consequence of their behavior on longer time periods.

Our paper contributes to this literature by comparing for the first time the role played on wealth decisions by financial literacy acquired during adulthood and money education received during childhood, and by analyzing how they are related not only with saving but also with retirement planning, investments in financial assets, the ownership of risky and safe assets, and debt holding.

3. Data and research hypotheses

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.*, 2011b). The module contains sixteen questions meant to assess general

understanding of financial topics. Following Van Rooij *et al.* (2011b, 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 well established indexes of basic and advanced literacy (their correlation is 0.435);[2] 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. Given the high correlation (0.653) between the answers to the two questions, we combine them 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. The three questions on financial literacy and money education describe what we call "financial education".

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 1,017 respondents in charge of household finances for a total of 6,404 observations with complete information from the 2005-2017 waves of DHS.

3.1. Research hypotheses

The measures of financial literacy capture basic and advanced knowledge of financial matters acquired during adulthood, while the measure of money education informs on whether the respondent received teachings on saving from the family during adolescence. We expect both financial literacy and money education to correlate with economic decisions. However, given the existing evidence from the literature (e.g., Christelis *et al.*, 2010; Van Rooij *et al.*, 2011b; Bucciol and Veronesi, 2014; Otto and Webley, 2015; Brown and Taylor, 2016), we also expect financial literacy and money education to be more likely associated with riskier and safer investments, respectively. Specifically, we formulate the following hypotheses:

> *Hyp.1.* Basic and advanced financial literacy make an individual more familiar with the financial environment, and are therefore positively correlated with the accumulation of saving and financial assets.

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[2] The module incorporates the so-called "Big Three" questions on financial literacy selected by Lusardi and Mitchell (2011) following the principles of simplicity, relevance, brevity and capacity to differentiate. We obtain two factors in line with the indexes of financial literacy if we consider one single factor analysis.

Hyp.2. Advanced financial literacy makes an individual better able to understand the characteristics of some complex assets, and is therefore positively correlated with the investment in risky (and plausibly more complex) assets.

Hyp.3. Money education from the family increases the propensity to save for a rainy day and protects an individual's capital from abrupt changes in value.

3.2 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 otherwise.[3] 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 otherwise.[4] 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 and risky assets 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.*, 2011b). The last variable in our analysis is called *debt*, and it is equal to one if the household has private loans (apart from home mortgages), extended lines of credit and outstanding debts, zero otherwise. As suggested by Lusardi and Tufano (2015), debt literacy is very low especially among women, the elderly and those with low income: this result is consistent with the

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[3] 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".

[4] 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".

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.

3.3. Summary 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 49% of respondents are workers, 58% have a high school diploma, and about 15% have college education. The average household net income is about 35,000 euros per year.[5] 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).[6] About 70% received advice on how to manage their money during adolescence. The two indexes on financial literacy are highly, though not extremely, correlated with each other (the correlation is 0.435) and virtually uncorrelated with money education (the polychoric correlation is -0.035 for basic literacy, and -0.047 for advanced literacy). 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. Interestingly, financial literacy is higher in portfolios made of safe and risky assets (with or without the inclusion of debt), while money education is more frequent in portfolios made of safe assets only, or safe and risky assets – but without debt.[7]

Table 1. Summary statistics

	Mean	Std. dev.	Min.	Max.
Financial outcomes				
Saving *(d)*	0.585	0.493	0	1
Retirement planning *(d)*	0.721	0.449	0	1
Financial assets	50,183.5	111,155.2	-97,660.84	3,642,061
Safe *(d)*	0.890	0.313	0	1
Risky *(d)*	0.258	0.438	0	1
Debt *(d)*	0.144	0.351	0	1
Financial education				
Basic financial literacy	0.891	0.191	0	1

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[5] 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.

[6] Statistical t-test on the mean comparison: 72.205; p-value <0.01.

[7] Appendix A.6 reports average financial education separately for each combination of assets.

Advanced financial literacy	0.651	0.286	0	1
Money education from family *(d)*	0.704	0.456	0	1
Control variables				
Risk averse	0.675	0.192	0	1
Future orientation	0.525	0.137	0	1
Female *(d)*	0.382	0.486	0	1
Age	58.302	13.668	24	90
With partner *(d)*	0.672	0.470	0	1
Household size -1	1.239	1.212	0	7
If children *(d)*	0.271	0.444	0	1
Worker *(d)*	0.491	0.500	0	1
Retired *(d)*	0.325	0.468	0	1
High school *(d)*	0.582	0.493	0	1
College *(d)*	0.148	0.356	0	1
Income	35,376.54	40,703.08	161.858	2,560,580
Poor health *(d)*	0.248	0.432	0	1

Notes: The final sample includes 6,404 observations on 1,017 respondents interviewed between 2005 and 2017. (d) indicates that the variable is a dummy.

4. Econometric analysis

We split the analysis in three parts. First, we investigate the relationship between basic and advanced financial literacy and our financial outcomes (Sub-section 4.1). Second, we study whether money education received during adolescence from the family is related to wealth decisions when adults, and how this effect compares with the effect of financial literacy (Sub-section 4.2). 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 4.3).

We estimate the following equation:

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

where $Y_{i,t}$ is one of the dependent variables representing the financial outcomes of respondent i at time t ($t = 2005, \ldots, 2017$) described in Section 3 such as saving, retirement planning, financial assets, safe assets, risky assets or 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; and both indexes of financial literacy and the dummy variable on whether

individuals received money education at age 12-16 from their family in Sub-section 4.2. 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 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.[8] Second, having time-invariant variables (on financial literacy as well as money education) prevents us from using a panel fixed-effects estimator. We therefore estimate random-effects regression models, incorporating a proxy for unit-specific effects by applying the Mundlak's correction (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). In addition, financial literacy is rather difficult to measure, also for potential measurement errors in financial variables (Van Rooij *et al.*, 2011b), and our indexes are only proxy measures of the true financial literacy. Although money education from family took place in the past, some unobservable confounders may also influence the relationship between this variable and respondents' wealth

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[8] Some of the financial literacy questions (the "big three" questions) were also asked to the same respondents in year 2010, as part of a new survey on retirement preparedness. The mean value of correct answers for each of the 2010 questions is very similar to that of the corresponding ones in 2005, meaning that the level of financial literacy is quite constant over time.

decisions. For instance, children who received money education may come from richer families and they may also be more concerned about money later in life.

Given that we do not have information on these potential confounders, our measures related to financial education (financial literacy and money education) may be endogenous.

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. Specifically, let us assume that in the model of Equation (1) there is potential endogeneity on variables *W*, thus causing inconsistent estimates. Lewbel (2012) suggests estimating a first-stage regression of the endogenous variables on the exogenous ones as in Equation (2),

$$W_i = \gamma_0 + Z_{i,t}\gamma_1 + X_{i,t}\gamma_2 + F_{i,t}\gamma_3 + \omega_{i,t} \tag{2}$$

and then generate instruments as the product between the residuals in Equation (2) and each exogenous (mean-centered) regressor. In order to achieve 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 supports this result in all our regressions. The analyses reported in this section show IV estimates for panel data, where instruments are created by using Lewbel's approach; Appendix B presents random-effect estimates without instrumented variables.

4.1. Financial literacy and wealth decisions

Table 2 presents Lewbel IV estimates on the relationship between financial literacy, measured by the two indexes of basic and advanced financial literacy, and our outcomes of interest: *saving*, *retirement planning*, *financial assets*, *safe assets*, *risky assets* and *debt*. We find that basic financial literacy is positively correlated only with the likelihood of having money saved (one standard deviation increase of basic financial literacy raises the probability to save by 0.191*0.196 =3.74 percentage points), while it is not a significant determinant of the other wealth decisions.

Thus, having basic financial knowledge may be equivalent to having "common sense" in financial decision-making. The index of basic financial literacy based on five simple financial questions might proxy for basic cognitive skills and is not enough to affect most of our financial outcomes.[9] The weak effect of basic financial literacy is in line with evidence from Van Rooij *et al.* (2011b).

On the other hand, having advanced financial literacy significantly and positively affects financial assets and, in particular, owning risky assets. The estimated coefficient suggests that one standard deviation increase in advanced financial literacy raises by 0.286*0.192 =5.49 percentage points the probability of investing in stock, options or mutual funds. Thus, using a different estimation technique we confirm previous evidence by Van Rooij *et al.* (2011b) on stock market participation. 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. We thus find support to Hypotheses 1 and 2, according to which financial literacy increases savings and financial assets, but only advanced financial literacy is associated to an investment in risky assets. Interestingly, we do not find a significant effect of advanced financial literacy on saving, retirement planning and debt. Individuals with more financial literacy may be able to manage their investments in a better way avoiding excessive borrowing and debt accumulation (Lusardi and Tufano, 2015). However, we find that socioeconomic variables, such as gender, civil status and education are significant predictors of debt holding in our sample (Column 6, Table 2).

Other important determinants 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, a higher degree of future orientation is associated with a better ability to accumulate financial assets and risky assets. Therefore, also time preferences play a role in describing people's decision making; planning may reflect individual features such as patience and diligence, which are usually associated with greater propensity to save (Lusardi and Mitchell, 2007b). Our results highlight the importance of taking these variables into account in analyzing the relationship between financial literacy and wealth decisions; indeed, risk averse individuals, or those who care about their future, might be more likely to invest in financial education to manage their investments in a better way.

Overall, results from Table 2 suggest the presence of a significant relationship between financial assets and the index of advanced rather than basic financial literacy. We notice, however, that the relationship found using the Lewbel approach is not as strong as we would obtain without

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[9] The same evidence is confirmed from regression models where advanced financial literacy is excluded from the specification. This suggests that basic financial literacy cannot be seen as a proxy for overall financial literacy.

correcting for endogeneity (see Appendix Table B.1). In such analysis, we find advanced financial literacy to positively correlate with all our dependent variables apart from debt holding, which in contrast is positively correlated with basic financial literacy. The size of the coefficients on financial literacy is also higher in Appendix Table B.1 than in Table 2. This evidence is in line with the existing literature, which finds a positive effect of financial literacy on retirement planning (e.g., Van Rooij *et al.*, 2011b) and more frequent debt holding among individuals who find it difficult to understand concepts related to debt (e.g., Gathergood, 2012; Lusardi and Tufano, 2015). We interpret the difference of our benchmark results as an indication that endogeneity is indeed present, and we should rely more on the Lewbel IV estimates presented in Table 2.

Table 2. Financial literacy (Lewbel IV estimates)

	(1) Saving	(2) Retirement planning	(3) Financial assets	(4) Safe assets	(5) Risky assets	(6) Debt
Basic financial literacy	0.196**	0.046	0.627	0.003	-0.068	0.008
	(0.094)	(0.110)	(0.853)	(0.076)	(0.066)	(0.064)
Advanced financial literacy	0.065	0.142	1.833**	0.109	0.192***	0.032
	(0.099)	(0.112)	(0.900)	(0.072)	(0.072)	(0.079)
Risk averse	0.017	-0.002	0.105	0.061**	-0.309***	-0.014
	(0.039)	(0.030)	(0.338)	(0.028)	(0.034)	(0.028)
Future orientation	0.096	0.061	1.189**	0.038	0.088*	0.057
	(0.061)	(0.044)	(0.503)	(0.040)	(0.048)	(0.044)
Female	0.022	0.026	0.239	0.021	-0.052**	-0.042*
	(0.028)	(0.033)	(0.257)	(0.019)	(0.024)	(0.024)
Age/10	0.323*	-0.347	4.151**	0.336**	0.086	-0.177
	(0.181)	(0.218)	(2.048)	(0.160)	(0.169)	(0.152)
$(Age/10)^2$	-0.005	0.023**	-0.102	-0.006	-0.007	0.012*
	(0.007)	(0.010)	(0.075)	(0.006)	(0.008)	(0.006)
With partner	0.087**	0.009	0.051	-0.027	-0.019	-0.057**
	(0.036)	(0.027)	(0.450)	(0.033)	(0.025)	(0.028)
Household size -1	-0.055**	0.012	-0.187	-0.004	-0.003	0.015
	(0.023)	(0.013)	(0.222)	(0.017)	(0.021)	(0.012)
If children	-0.003	0.050	0.119	-0.023	0.006	-0.021
	(0.047)	(0.036)	(0.343)	(0.029)	(0.038)	(0.032)
Worker	0.157***	-0.027	0.414	0.021	0.024	-0.012
	(0.039)	(0.024)	(0.280)	(0.020)	(0.028)	(0.024)
Retired	0.045	-0.012	0.727**	0.051**	0.026	0.024
	(0.038)	(0.035)	(0.303)	(0.024)	(0.030)	(0.024)
High school	-0.036	0.012	-0.017	-0.018	0.094	0.145**
	(0.061)	(0.022)	(0.765)	(0.063)	(0.070)	(0.060)
College	-0.170	-0.048	-0.450	0.053	0.135	0.270***
	(0.135)	(0.068)	(1.092)	(0.076)	(0.092)	(0.105)
Income	0.044***	-0.009	0.126	-0.005	-0.007	0.000
	(0.011)	(0.008)	(0.117)	(0.010)	(0.009)	(0.007)
Poor health	0.010	0.014	-0.069	-0.015	0.001	0.020
	(0.018)	(0.014)	(0.173)	(0.014)	(0.017)	(0.014)
Constant	-3.074***	-1.642***	-12.105***	0.510*	-1.241***	0.840**
	(0.454)	(0.498)	(3.940)	(0.283)	(0.406)	(0.375)

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
Hansen J test (*p*-value)	0.620	0.236	0.330	0.201	0.175	0.416
Avg. dependent variable	0.585	0.721	9.273	0.890	0.258	0.144
Number of respondents	1,017	1,017	1,017	1,017	1,017	1,017
Observations	6,404	6,404	6,404	6,404	6,404	6,404

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.

4.2. Money education from family and wealth decisions

In this sub-section, we investigate the association between having received money education during adolescence in the family environment and the outcomes on wealth decisions, and how this compares with the role of financial literacy. Table 3 presents coefficient estimates of a model where we include both indexes of financial literacy (basic and advanced) and the variable labeled "money education," that is a dummy variable on having received teachings about saving from the family at age 12-16. All the variables on financial education have been instrumented by using Lewbel's approach. We find that having received money education during adolescence significantly increases the propensity to save when adults by 10.6% (Column 1). In addition, money education is negatively correlated with the likelihood of owning risky assets (-13%, Column 5) and holding debt (-10.8%, Column 6), in line with the idea that money education is more likely associated to safer assets and saving (Hypothesis 3).

We now compare the effect of having received money education during adolescence with the effect of financial literacy measured when adults. A previous work by Grohmann *et al.* (2015) suggests that the positive effects of parental socialization may partially derive from building better financial knowledge, which in turn stimulates better financial decisions during adulthood. Thus, financial literacy may partially mediate the relation between childhood experiences and financial behaviors. However, we found negligible correlation between our measures of financial literacy and money education (see Sub-section 3.3). Moreover, we notice that the coefficients on the financial literacy variables change little with respect to those in Table 2, which means that teaching adolescents to save and providing financial literacy during adulthood are different ways to boost financial knowledge. Indeed, our measure of money education informs on whether the respondent received teachings specifically related to saving and it does not capture a broader set of financial socialization practices. Thus, it seems plausible that our measure of money education directly affects respondents' financial attitudes, aspirations and behavior, rather than their willingness to learn financial concepts.

Our results reported in Table 3 indicate that advanced financial literacy is still a significant determinant of wealth decisions, positively associated with financial and risky assets, even after controlling for money education. Moreover, in line with results by Lusardi and Mitchell (2007a), we find that advanced financial literacy during adulthood positively affects the likelihood of thinking about retirement. However, we show that having received money education in young age is also an important factor affecting wealth decisions when adults.

In addition, we find that investors who are more financially literate are more likely to invest their money in a speculative way with the purpose of increasing their gains (see Hypothesis 2). Column 5 of Table 3 confirms these results and shows that the propensity of holding risky assets is positively influenced by having advanced financial knowledge; however, money education affects the same wealth outcome in the opposite direction, with an effect that in magnitude partly counterbalances the effect of advanced financial literacy. Moreover, the last specification (Column 6) of Table 3 shows that while financial literacy does not affect the likelihood of holding debt, people who grew up learning the value of money are less likely to hold debt. These results indicate that advices about the importance of money shape attitudes toward saving and debt. Individuals may choose to save, or may refrain from borrowing, because they have been told that this is the right thing to do (Almenberg *et al.*, 2018). However, over the lifespan, financial choices become more complicated as consumers age: individuals in different age groups display different perspectives, influences, and pressures (Zick *et al.*, 2012). To shed more light on this aspect, in Appendix C we examine heterogeneity in financial behaviors across different age groups. Results are reported in Appendix Table C.1.

Overall, our findings show the importance of also considering money education received from the family at young age in analyzing wealth decisions; the benefits of parental education in stimulating a good economic behavior of children, which is easily maintained later in life, complement the positive effect of financial literacy in fostering wealth decision-making.

Table 3. Financial literacy and money education (Lewbel IV estimates)

	(1) Saving	(2) Retirement planning	(3) Financial assets	(4) Safe assets	(5) Risky assets	(6) Debt
Basic financial literacy	0.211**	0.062	0.798	0.027	-0.098	0.036
	(0.091)	(0.108)	(0.854)	(0.075)	(0.070)	(0.065)
Advanced financial literacy	0.043	0.192*	1.815**	0.089	0.251***	0.029
	(0.095)	(0.110)	(0.862)	(0.068)	(0.073)	(0.077)
Money education from family	0.106*	0.065	0.598	0.068	-0.131**	-0.108**
	(0.061)	(0.071)	(0.601)	(0.046)	(0.051)	(0.047)
Risk averse	0.014	-0.002	0.088	0.058**	-0.302***	-0.012
	(0.039)	(0.030)	(0.338)	(0.028)	(0.034)	(0.028)
Future orientation	0.084	0.057	1.091**	0.027	0.096**	0.069
	(0.061)	(0.044)	(0.514)	(0.041)	(0.048)	(0.043)
Female	0.015	0.031	0.218	0.016	-0.039	-0.037
	(0.028)	(0.033)	(0.253)	(0.019)	(0.025)	(0.023)
Age/10	0.323*	-0.327	4.218**	0.340**	0.097	-0.175
	(0.181)	(0.218)	(2.025)	(0.158)	(0.170)	(0.149)
$(Age/10)^2$	-0.006	0.023**	-0.104	-0.006	-0.006	0.012*
	(0.007)	(0.010)	(0.075)	(0.006)	(0.008)	(0.006)
With partner	0.087**	0.009	0.052	-0.027	-0.019	-0.057**
	(0.036)	(0.027)	(0.451)	(0.033)	(0.025)	(0.028)
Household size -1	-0.055**	0.012	-0.183	-0.004	-0.003	0.014
	(0.023)	(0.013)	(0.222)	(0.018)	(0.021)	(0.012)
If children	-0.003	0.050	0.120	-0.023	0.006	-0.021
	(0.047)	(0.036)	(0.344)	(0.030)	(0.038)	(0.031)
Worker	0.155***	-0.027	0.403	0.020	0.026	-0.010
	(0.039)	(0.024)	(0.279)	(0.020)	(0.028)	(0.024)
Retired	0.044	-0.012	0.720**	0.050**	0.027	0.025
	(0.038)	(0.035)	(0.302)	(0.024)	(0.030)	(0.024)
High school	-0.039	0.012	-0.036	-0.021	0.099	0.146**
	(0.060)	(0.022)	(0.763)	(0.063)	(0.071)	(0.059)
College	-0.174	-0.047	-0.476	0.048	0.143	0.273***
	(0.135)	(0.068)	(1.078)	(0.074)	(0.093)	(0.105)
Income	0.044***	-0.009	0.126	-0.005	-0.007	0.000
	(0.011)	(0.008)	(0.117)	(0.010)	(0.009)	(0.007)
Poor health	0.011	0.014	-0.063	-0.014	-0.000	0.020
	(0.018)	(0.014)	(0.172)	(0.014)	(0.017)	(0.014)
Constant	-3.189***	-1.637***	-12.655***	0.423	-1.072***	0.922**
	(0.462)	(0.504)	(3.930)	(0.281)	(0.413)	(0.373)
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
Hansen J test (p-value)	0.515	0.323	0.470	0.262	0.103	0.471
Avg. dependent variable	0.585	0.721	9.273	0.890	0.258	0.144
Number of respondents	1,017	1,017	1,017	1,017	1,017	1,017
Observations	6,404	6,404	6,404	6,404	6,404	6,404

Notes: The instrumented variables are in italics. Standard errors clustered at the respondent level are in parentheses. ***, **, * indicate significance at the 1%, 5%, and 10% level, respectively.

4.3. Gender differences

We now enrich the models in Table 3 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.[10] According to Almenberg and Dreber (2015), a significant part of the gender gap in stock market participation can be explained by gender differences in financial literacy. However, gender differences may also matter in the socialization process. In particular, children may be socialized differently regarding saving and budgeting depending on their gender. This motivates our analysis on which, however, we do not have a priori hypotheses.

We report the results in Table 4, 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 additional effects compared to those shown in Table 3. For males, having advanced financial literacy affects significantly and positively all the financial outcomes in Columns 1-5, while it is negatively associated with the likelihood of holding debt. In general, the magnitude of the coefficients is also relatively higher than in Table 3, 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 4 report a narrower set of effects: at the 1% level, we see that for females advanced financial literacy is positively correlated only with risky assets, whereas it has a weaker effect on the general propensity to hold financial assets. As for males, we find that money education is positively correlated with financial and safe assets; conversely, the negative effect of money education on debt holding is statistically significant only among females. This result is consistent with previous findings by Almenberg *et al.* (2018), who investigate intergenerational transmission of financial behavior to shed light on the determinants of household debt. The authors find that attitudes towards debt are more easily transmitted from parents to daughters, as they are much more likely than sons to discuss about personal financial matters with family members.

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 debt holding, with larger effects among

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[10] We run t-tests on mean comparison. Basic financial literacy: 12.994, p-value <0.01; advanced financial literacy: 30.926, p-value <0.01; money education: -2.689, p-value <0.01.

males than females for saving and vice versa for debt holding. As regards advanced financial literacy, the coefficients by gender are statistically different only with respect to financial assets; the correlation between advanced financial literacy and this wealth outcome is larger among males than females.

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

	(1) **Saving**	(2) **Retirement planning**	(3) **Financial assets**	(4) **Safe assets**	(5) **Risky assets**	(6) **Debt**
Basic financial literacy	0.088	0.095	0.752	0.016	0.005	0.222***
(Males)	(0.096)	(0.112)	(0.975)	(0.063)	(0.074)	(0.068)
Advanced financial literacy	0.238***	0.282***	2.544***	0.107**	0.322***	-0.146**
(Males)	(0.073)	(0.089)	(0.696)	(0.047)	(0.061)	(0.063)
Money education from family	0.107***	0.120***	0.687**	0.044**	-0.009	-0.036
(Males)	(0.034)	(0.041)	(0.286)	(0.019)	(0.033)	(0.028)
Basic financial literacy	0.076	0.106	1.013	0.074	-0.032	0.043
(Females)	(0.086)	(0.102)	(0.820)	(0.071)	(0.060)	(0.052)
Advanced financial literacy	0.117	0.133	0.987*	0.038	0.216***	0.015
(Females)	(0.072)	(0.085)	(0.552)	(0.043)	(0.048)	(0.049)
Money education from family	0.017	0.081	1.071***	0.079***	0.005	-0.111***
(Females)	(0.042)	(0.052)	(0.368)	(0.028)	(0.028)	(0.032)
Risk averse	0.024	-0.001	0.116	0.058**	-0.305***	-0.019
	(0.039)	(0.030)	(0.334)	(0.028)	(0.034)	(0.028)
Future orientation	0.076	0.052	1.030**	0.030	0.079	0.071
	(0.060)	(0.044)	(0.497)	(0.039)	(0.049)	(0.044)
Female	0.180	0.141	0.654	-0.020	0.048	0.064
	(0.117)	(0.143)	(1.206)	(0.089)	(0.086)	(0.075)
Age/10	0.346*	-0.313	4.139**	0.332**	0.121	-0.173
	(0.178)	(0.216)	(2.021)	(0.157)	(0.168)	(0.148)
$(Age/10)^2$	-0.005	0.023**	-0.105	-0.006	-0.007	0.012*
	(0.007)	(0.010)	(0.075)	(0.006)	(0.008)	(0.006)
With partner	0.087**	0.010	0.059	-0.027	-0.019	-0.057**
	(0.036)	(0.027)	(0.450)	(0.033)	(0.025)	(0.028)
Household size -1	-0.055**	0.012	-0.180	-0.004	-0.003	0.014
	(0.023)	(0.013)	(0.222)	(0.017)	(0.021)	(0.012)
If children	-0.002	0.050	0.114	-0.023	0.006	-0.020
	(0.047)	(0.036)	(0.344)	(0.030)	(0.038)	(0.031)
Worker	0.156***	-0.027	0.417	0.021	0.025	-0.012
	(0.039)	(0.024)	(0.280)	(0.020)	(0.028)	(0.024)
Retired	0.045	-0.012	0.734**	0.051**	0.027	0.023
	(0.038)	(0.035)	(0.303)	(0.024)	(0.030)	(0.024)
High school	-0.030	0.011	-0.076	-0.024	0.094	0.138**
	(0.060)	(0.022)	(0.760)	(0.063)	(0.070)	(0.060)
College	-0.161	-0.047	-0.494	0.047	0.138	0.265**
	(0.135)	(0.068)	(1.074)	(0.075)	(0.092)	(0.104)
Income	0.044***	-0.009	0.126	-0.005	-0.007	0.001
	(0.011)	(0.008)	(0.117)	(0.009)	(0.009)	(0.007)
Poor health	0.010	0.014	-0.056	-0.013	0.001	0.020
	(0.017)	(0.014)	(0.172)	(0.014)	(0.017)	(0.014)
Constant	-3.032***	-1.672***	-13.016***	0.425	-1.181***	0.732**
	(0.448)	(0.493)	(3.920)	(0.278)	(0.401)	(0.361)
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.	[0.927]	[0.943]	[0.839]	[0.538]	[0.696]	[0.038]

Test by gender: Adv. fin. lit.	[0.234]	[0.218]	[0.074]	[0.270]	[0.168]	[0.043]
Test by gender: Money educ.	[0.098]	[0.555]	[0.411]	[0.313]	[0.744]	[0.078]
Hansen J test (p-value)	0.511	0.593	0.418	0.429	0.440	0.896
Avg. dependent variable	0.585	0.721	9.273	0.890	0.258	0.144
Number of respondents	1,017	1,017	1,017	1,017	1,017	1,017
Observations	6,404	6,404	6,404	6,404	6,404	6,404

Notes: The instrumented variables are in italics. 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.

5. Conclusions

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

By using the recent identification approach developed by Lewbel (2012), we show that basic financial literacy is not enough to affect most of the wealth decisions under examination, as it may be equivalent to having basic cognitive skills in decision-making. Advanced financial literacy significantly and positively affects financial assets and, in particular, owning risky assets; indeed, investors who deal with these financial instruments need deep understanding of the financial markets to properly manage their financial resources.

In addition, we find that when both financial literacy and money education received from the family during adolescence are included in the analysis, they are both significant drivers of wealth decisions. However, while advanced financial literacy has a positive effect on the likelihood of holding risky assets, money education acquired during adolescence is negatively associated with the same outcome. Interestingly, we find that money education from the family significantly decreases the likelihood of holding debt while financial literacy does not. When we explore gender differences, we find that the effect of advanced financial literacy on financial assets is larger among males than females while the effect of money education on debt holding is larger among females consistently with the intergenerational transmission of attitudes towards debt from parents to daughters (Almenberg *et al.*, 2018).

Overall, our results highlight the complementarity between the two channels of financial education, with financial literacy increasing the propensity to invest in risky assets and money education in safer assets. Money education received during adolescence is then as important as financial literacy to describe individuals' wealth decisions, although our definition works mainly

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through investment in safer assets. Consequently, it is important to develop policies promoting money education at young age in addition to financial literacy. 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.*, 2003). 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.

Unfortunately, our dataset does not allow to investigate the effect of parents as role models on their children financial behavior later in life, and we leave this as future research to investigate. 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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Appendix A. Key variables construction and summary statistics

A.1. Financial literacy indexes

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 Bucciol 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.

A.6. Summary statistics by portfolio composition

Table A.6. Average financial education by portfolio composition

	Observations	Basic literacy	Advanced literacy	Money education
None	543	0.859	0.573	0.637
Safe	3,489	0.867	0.599	0.721
Safe + Debt	649	0.911	0.597	0.638
Safe + Risky	1,438	0.946	0.820	0.737
Safe + Risky + Debt	202	0.949	0.783	0.604
Risky	83	0.904	0.557	0.614
Overall	6,404	0.891	0.651	0.704

Notes: The portfolio is split in safe assets (*safe*), risky assets (*Risky*) and debt holdings (*Debt*). The table reports average financial education separately for each combination of assets.

Appendix B. Random-effect estimates (without instruments)

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

	(1) Saving	(2) Retirement planning	(3) Financial assets	(4) Safe assets	(5) Risky assets	(6) Debt
Basic financial literacy	0.079	0.092	0.922	0.049	0.021	0.122***
	(0.064)	(0.072)	(0.637)	(0.048)	(0.047)	(0.041)
Advanced financial literacy	0.137***	0.185***	1.931***	0.068**	0.321***	-0.055
	(0.050)	(0.055)	(0.436)	(0.032)	(0.036)	(0.038)
Risk averse	0.021	-0.001	0.114	0.052*	-0.316***	-0.018
	(0.039)	(0.030)	(0.338)	(0.028)	(0.034)	(0.028)
Future orientation	0.093	0.055	1.067**	0.037	0.082*	0.061
	(0.060)	(0.044)	(0.499)	(0.039)	(0.048)	(0.043)
Female	0.029	0.034	0.267	0.017	-0.030	-0.051**
	(0.026)	(0.030)	(0.236)	(0.018)	(0.023)	(0.022)
Age/10	0.321*	-0.324	4.331**	0.347**	0.154	-0.181
	(0.178)	(0.216)	(2.075)	(0.162)	(0.167)	(0.150)
$(\text{Age}/10)^2$	-0.005	0.023**	-0.098	-0.006	-0.007	0.012*
	(0.007)	(0.010)	(0.075)	(0.006)	(0.008)	(0.006)
With partner	0.087**	0.009	0.045	-0.028	-0.019	-0.057**
	(0.036)	(0.027)	(0.456)	(0.033)	(0.025)	(0.028)
Household size -1	-0.055**	0.012	-0.181	-0.004	-0.003	0.015
	(0.023)	(0.013)	(0.223)	(0.018)	(0.021)	(0.012)
If children	-0.003	0.050	0.128	-0.024	0.007	-0.020
	(0.047)	(0.036)	(0.344)	(0.030)	(0.038)	(0.031)
Worker	0.157***	-0.027	0.404	0.021	0.025	-0.012
	(0.039)	(0.024)	(0.280)	(0.020)	(0.028)	(0.024)
Retired	0.045	-0.012	0.737**	0.052**	0.026	0.024
	(0.038)	(0.035)	(0.305)	(0.024)	(0.030)	(0.024)
High school	-0.029	0.012	0.043	-0.015	0.096	0.138**
	(0.061)	(0.022)	(0.797)	(0.067)	(0.069)	(0.060)
College	-0.164	-0.048	-0.384	0.044	0.137	0.264**
	(0.135)	(0.068)	(1.067)	(0.076)	(0.092)	(0.104)
Income	0.044***	-0.009	0.122	-0.005	-0.007	0.001
	(0.011)	(0.008)	(0.117)	(0.010)	(0.009)	(0.007)
Poor health	0.009	0.014	-0.061	-0.013	0.000	0.021
	(0.017)	(0.014)	(0.173)	(0.014)	(0.017)	(0.014)
Constant	-2.988***	-1.598***	-12.164***	0.424	-1.095***	0.736**
	(0.443)	(0.486)	(4.005)	(0.286)	(0.399)	(0.367)
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	0.135	0.048	0.223	0.046
Avg. dependent variable	0.585	0.721	9.273	0.890	0.258	0.144
Number of respondents	1,017	1,017	1,017	1,017	1,017	1,017
Observations	6,404	6,404	6,404	6,404	6,404	6,404

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 B.2. Financial literacy and money education (Random-effect estimates)

	(1) Saving	(2) Retirement planning	(3) Financial assets	(4) Safe assets	(5) Risky assets	(6) Debt
Basic financial literacy	0.084	0.099	0.979	0.053	0.022	0.117***
	(0.064)	(0.073)	(0.634)	(0.048)	(0.047)	(0.041)
Advanced financial literacy	0.134***	0.178***	1.892***	0.065**	0.321***	-0.052
	(0.049)	(0.055)	(0.435)	(0.032)	(0.036)	(0.038)
Money education from family	0.069***	0.101***	0.868***	0.061***	0.009	-0.061***
	(0.026)	(0.029)	(0.218)	(0.016)	(0.022)	(0.020)
Risk averse	0.020	-0.002	0.095	0.050*	-0.316***	-0.017
	(0.039)	(0.030)	(0.338)	(0.028)	(0.034)	(0.028)
Future orientation	0.085	0.051	0.957*	0.028	0.081*	0.068
	(0.060)	(0.044)	(0.501)	(0.039)	(0.048)	(0.043)
Female	0.026	0.028	0.226	0.014	-0.030	-0.048**
	(0.026)	(0.030)	(0.233)	(0.017)	(0.023)	(0.022)
Age/10	0.324*	-0.325	4.361**	0.350**	0.154	-0.183
	(0.177)	(0.217)	(2.051)	(0.161)	(0.168)	(0.149)
$(Age/10)^2$	-0.006	0.023**	-0.101	-0.006	-0.007	0.012*
	(0.007)	(0.010)	(0.075)	(0.006)	(0.008)	(0.006)
With partner	0.087**	0.009	0.047	-0.028	-0.019	-0.057**
	(0.036)	(0.027)	(0.456)	(0.033)	(0.025)	(0.028)
Household size -1	-0.055**	0.012	-0.177	-0.004	-0.003	0.014
	(0.023)	(0.013)	(0.224)	(0.018)	(0.021)	(0.012)
If children	-0.003	0.050	0.129	-0.024	0.007	-0.020
	(0.047)	(0.036)	(0.345)	(0.030)	(0.038)	(0.031)
Worker	0.156***	-0.027	0.392	0.020	0.025	-0.011
	(0.039)	(0.024)	(0.279)	(0.020)	(0.028)	(0.023)
Retired	0.044	-0.013	0.729**	0.051**	0.026	0.024
	(0.038)	(0.035)	(0.304)	(0.024)	(0.030)	(0.024)
High school	-0.030	0.011	0.023	-0.017	0.096	0.139**
	(0.060)	(0.021)	(0.791)	(0.067)	(0.069)	(0.059)
College	-0.166	-0.049	-0.417	0.042	0.137	0.265**
	(0.135)	(0.068)	(1.051)	(0.075)	(0.092)	(0.104)
Income	0.044***	-0.009	0.123	-0.005	-0.007	0.001
	(0.011)	(0.008)	(0.117)	(0.010)	(0.009)	(0.007)
Poor health	0.010	0.014	-0.055	-0.013	0.000	0.021
	(0.017)	(0.014)	(0.173)	(0.014)	(0.017)	(0.014)
Constant	-3.050***	-1.680***	-12.926***	0.370	-1.102***	0.789**
	(0.447)	(0.489)	(3.953)	(0.282)	(0.400)	(0.364)
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	0.103	0.139	0.051	0.223	0.051
Avg. dependent variable	0.585	0.721	9.273	0.890	0.258	0.144
Number of respondents	1,017	1,017	1,017	1,017	1,017	1,017
Observations	6,404	6,404	6,404	6,404	6,404	6,404

Notes: Standard errors clustered at the respondent level are in parentheses. ***, **, * indicate significance at the 1%, 5%, and 10% level, respectively.

Table B.3. Financial literacy and money education by gender (Random-effect estimates)

	(1) Saving	(2) Retirement planning	(3) Financial assets	(4) Safe assets	(5) Risky assets	(6) Debt
Basic financial literacy	0.106	0.099	0.812	0.024	0.040	0.163**
(Males)	(0.092)	(0.103)	(0.978)	(0.063)	(0.071)	(0.066)
Advanced financial literacy	0.165**	0.221***	2.545***	0.088**	0.397***	-0.111*
(Males)	(0.066)	(0.070)	(0.633)	(0.044)	(0.053)	(0.057)
Money education from family	0.113***	0.116***	0.862***	0.056***	0.019	-0.051*
(Males)	(0.033)	(0.036)	(0.272)	(0.019)	(0.031)	(0.027)
Basic financial literacy	0.050	0.091	1.054	0.080	-0.008	0.079
(Females)	(0.085)	(0.099)	(0.802)	(0.071)	(0.060)	(0.051)
Advanced financial literacy	0.102	0.128	1.091**	0.040	0.223***	0.018
(Females)	(0.070)	(0.081)	(0.541)	(0.042)	(0.047)	(0.047)
Money education from family	-0.003	0.079*	0.923***	0.071**	-0.003	-0.083***
(Females)	(0.040)	(0.047)	(0.356)	(0.028)	(0.028)	(0.031)
Risk averse	0.022	-0.001	0.124	0.051*	-0.312***	-0.018
	(0.039)	(0.030)	(0.338)	(0.029)	(0.034)	(0.028)
Future orientation	0.082	0.050	0.937*	0.027	0.078	0.069
	(0.060)	(0.044)	(0.502)	(0.040)	(0.048)	(0.043)
Female	0.196*	0.117	0.846	-0.016	0.132*	-0.029
	(0.107)	(0.126)	(1.125)	(0.085)	(0.080)	(0.072)
Age/10	0.333*	-0.325	4.272**	0.346**	0.145	-0.173
	(0.178)	(0.217)	(2.048)	(0.161)	(0.167)	(0.149)
$(Age/10)^2$	-0.005	0.023**	-0.101	-0.006	-0.007	0.012*
	(0.007)	(0.010)	(0.076)	(0.006)	(0.008)	(0.006)
With partner	0.087**	0.009	0.053	-0.027	-0.018	-0.057**
	(0.036)	(0.027)	(0.456)	(0.033)	(0.025)	(0.028)
Household size -1	-0.055**	0.012	-0.178	-0.004	-0.003	0.014
	(0.023)	(0.013)	(0.224)	(0.018)	(0.021)	(0.012)
If children	-0.002	0.050	0.128	-0.024	0.007	-0.020
	(0.047)	(0.036)	(0.345)	(0.030)	(0.038)	(0.031)
Worker	0.156***	-0.027	0.404	0.020	0.026	-0.012
	(0.039)	(0.024)	(0.279)	(0.020)	(0.028)	(0.024)
Retired	0.045	-0.012	0.742**	0.052**	0.027	0.023
	(0.038)	(0.035)	(0.304)	(0.024)	(0.030)	(0.024)
High school	-0.032	0.010	-0.001	-0.017	0.092	0.140**
	(0.060)	(0.022)	(0.792)	(0.067)	(0.069)	(0.059)
College	-0.164	-0.049	-0.420	0.042	0.137	0.266**
	(0.135)	(0.068)	(1.055)	(0.075)	(0.092)	(0.104)
Income	0.044***	-0.009	0.123	-0.005	-0.007	0.001
	(0.011)	(0.008)	(0.117)	(0.010)	(0.009)	(0.007)
Poor health	0.010	0.014	-0.052	-0.012	0.000	0.020
	(0.017)	(0.014)	(0.173)	(0.014)	(0.017)	(0.014)
Constant	-3.086***	-1.702***	-13.131***	0.380	-1.156***	0.783**
	(0.448)	(0.491)	(3.991)	(0.285)	(0.399)	(0.361)
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.	[0.653]	[0.958]	[0.847]	[0.552]	[0.598]	[0.321]
Test by gender: Adv. fin. lit.	[0.498]	[0.367]	[0.071]	[0.412]	[0.012]	[0.075]
Test by gender: Money educ.	[0.025]	[0.531]	[0.892]	[0.666]	[0.601]	[0.436]
R-squared	0.152	0.104	0.141	0.052	0.225	0.056
Avg. dependent variable	0.585	0.721	9.273	0.890	0.258	0.144
Number of respondents	1,017	1,017	1,017	1,017	1,017	1,017
Observations	6,404	6,404	6,404	6,404	6,404	6,404

Notes: 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.

Appendix C. Heterogeneity across age groups

Table C.1. Financial literacy and money education across age groups (Lewbel IV estimates)

	(1) Saving	(2) Retirement planning	(3) Financial assets	(4) Safe assets	(5) Risky assets	(6) Debt
Panel (a): age 18-40						
Basic financial literacy	0.126	0.305	-0.762	-0.171	-0.021	-0.031
	(0.123)	(0.189)	(1.379)	(0.133)	(0.138)	(0.128)
Advanced financial literacy	0.037	0.063	1.405	0.172**	0.178**	0.092
	(0.103)	(0.150)	(0.975)	(0.084)	(0.077)	(0.093)
Money education from family	-0.007	0.063	1.517**	0.108	0.016	-0.092
	(0.077)	(0.105)	(0.709)	(0.067)	(0.069)	(0.064)
Risk averse	-0.033**	-0.004	-0.192	0.001	-0.046***	-0.002
	(0.015)	(0.014)	(0.164)	(0.017)	(0.013)	(0.012)
Future orientation	0.003	-0.001	0.019	0.002	-0.001	0.004**
	(0.002)	(0.002)	(0.021)	(0.002)	(0.001)	(0.002)
Hansen J test (p-value)	0.287	0.756	0.706	0.609	0.709	0.590
Avg. dependent variable	0.591	0.546	18977.23	0.809	0.192	0.209
Number of respondents	225	225	225	225	225	225
Observations	733	733	733	733	733	733
Panel (b): age 41-65						
Basic financial literacy	0.168*	0.214*	0.728	0.073	-0.060	0.152**
	(0.091)	(0.117)	(1.076)	(0.083)	(0.067)	(0.063)
Advanced financial literacy	0.034	-0.032	2.325**	0.073	0.304***	-0.087
	(0.095)	(0.110)	(0.978)	(0.067)	(0.071)	(0.068)
Money education from family	0.185***	0.104	0.532	0.056	-0.126**	-0.124**
	(0.065)	(0.074)	(0.646)	(0.045)	(0.055)	(0.053)
Risk averse	0.011	0.002	0.077	0.012**	-0.037***	-0.001
	(0.007)	(0.005)	(0.067)	(0.006)	(0.007)	(0.006)
Future orientation	0.001	0.001	0.016*	0.000	0.001	0.001
	(0.001)	(0.001)	(0.008)	(0.001)	(0.001)	(0.001)
Hansen J test (p-value)	0.594	0.637	0.154	0.322	0.320	0.865
Avg. dependent variable	0.566	0.733	4,923.05	0.883	0.253	0.160
Number of respondents	661	661	661	661	661	661
Observations	3,567	3,567	3,567	3,567	3,567	3,567
Panel (c): age 66-90						
Basic financial literacy	0.184	-0.062	-0.049	-0.075	-0.043	0.004
	(0.123)	(0.140)	(0.903)	(0.059)	(0.086)	(0.054)
Advanced financial literacy	0.029	0.121	2.253***	0.086*	0.261***	0.006
	(0.095)	(0.110)	(0.660)	(0.052)	(0.079)	(0.058)
Money education from family	0.188**	0.164*	1.823***	0.131**	-0.002	-0.035
	(0.078)	(0.088)	(0.657)	(0.054)	(0.069)	(0.051)
Risk averse	0.000	-0.005	-0.034	0.004	-0.038***	-0.009*
	(0.008)	(0.006)	(0.058)	(0.005)	(0.007)	(0.005)
Future orientation	0.000	0.000	-0.003	-0.001	0.001	0.000
	(0.001)	(0.001)	(0.007)	(0.001)	(0.001)	(0.001)

Hansen J test (p-value)	0.463	0.935	0.785	0.427	0.435	0.988
Avg. dependent variable	0.614	0.761	66,582.85	0.931	0.289	0.094
Number of respondents	402	402	402	402	402	402
Observations	2,104	2,104	2,104	2,104	2,104	2,104

Notes: 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. The instrumented variables are in italics. Other explanatory variables not reported in this table are the same as included in vectors $X_{i,t}$ and $F_{i,t}$ of equation (1).

Table C.1 shows regression results of a model where we use the same specification reported in equation (1) to repeat our analysis in three different subsamples. Specifically, we define three age-groups in our sample (18-40, 41-65, 66-90) and we explore the relationship between financial education and behavior across them. This provides helpful information for policy makers to develop effective financial education programs that meet the needs of a varied consumer population in ways that a "one-size-fits-all approach" cannot.

We find that both our financial education measures exhibit significant associations with the outcome variables, but with different patterns.

Our results reported in panel (a) indicate that financial education variables are significantly related with young adults' propensity to invest in financial assets (Column 3), holding both safe and risky assets. A possible interpretation is that by this age individuals may choose to invest their money in financial assets with the purpose of building their savings faster. Other important determinants of our financial outcomes are the variables on risk and time preferences. Interestingly, we find that an increase in future orientation among young adults is positively associated with the likelihood of holding debt. It is possible that young people, who care more about their future, are also more likely to think forward, incurring planning costs in the short-term for potential benefits in the long-term (Bucciol and Zarri, 2019). Results among middle-aged individuals are in line with those reported for the full sample (Table 3). In addition, we find a positive and significant association between basic financial literacy and holding debt. Individuals in this age group should be the most financially active and may optimally dissave; for example, an increase in basic financial knowledge among working-age individuals may foster their propensity to borrow to invest in human capital for them or for their children. Finally, among older-age individuals, money education affects significantly and positively all the financial outcomes in Columns 1-4. Here we interpret our outcome on retirement planning as individuals' general propensity to think about their desired retirement lifestyles. In particular, individuals in their 70s who received money education may find beneficial to hold a conservative investment portfolio, which ensures a proper amount of finances that can be used for possible healthcare expenses.

Chapter 2

DOES FINANCIAL SATISFACTION AFFECT ATTITUDES TOWARDS CHEATING?

Abstract

Using Dutch data from the LISS Panel, we study the effect of financial satisfaction on multiple dimensions of individuals' attitudes towards dishonesty, namely benefits fraud, tax evasion, fare evasion, stealing property and bribery. We use two indices of financial literacy as instruments to deal with the potential endogeneity of financial satisfaction. Financial satisfaction significantly affects the propensity to engage in cheating towards the government. However, other forms of dishonesty are mainly influenced by personal characteristics such as differences in risk aversion. We show that love of money and being trusting might also affect individuals' ethical behavior, as they are significantly related with the acceptability of immoral conduct. Our results are useful to deepen our knowledge about the factors affecting attitudes towards cheating and, consequently, think of ways to limit it.

1. Introduction

The increasing perception of dishonesty in everyday social interactions has led to define the concept of "*cheating culture*", in which individuals justify cheating behavior, consider it as a means to achieve their goals and believe that everyone cheats in order to succeed (Crittenden *et al.*, 2009). Several theories have been developed on why individuals undertake unethical actions. According to the standard economic models, wealth-maximizing individuals maintain ethical behaviors as long as resulting rewards outweigh potential gains from unethical actions (Becker, 1968). Subsequently, Chang (1998) argues that it is perceived behavioral control, defined as people's perception of their ability to perform the behavior of interest, which guides people's choices. Most recent approaches in explaining dishonesty show that individuals do not cheat as much as they can, because they are interested in maintaining a positive self-concept (Mazar *et al.*, 2008). Therefore, both economic incentives and psychological factors are significant predictors of unethical behavior, which could be related to individual attitudes, cultural traditions and socioeconomic conditions.

Previous literature relates cheating behavior with a range of socio-demographic variables. Dreber and Johannesson (2008) report that males lie more than females to secure monetary benefits; along this line, Friesen and Gangadharan (2012) find that men cheat more to achieve personal gains. In contrast, other authors have found no gender differences in ethical behaviors (Kidwell *et al.*, 1987; Singhapakdi and Vitell, 1990). Most studies consider age as a driving determinant of honest behavior (Torgler, 2006; Friesen and Gangadharan, 2012). Lago-Peñas and Lago-Peñas (2010) find a positive relation between age and the development of ethical standards; similarly, in the context of fiscal compliance, Torgler (2006) shows that tax morale rises with age. Occupational status and education may also influence dishonesty by changing the opportunities to offenders in several unethical activities (Anwar *et al.*, 2017).

In the present study we focus on the effect of financial satisfaction as a new potential determinant of cheating attitudes. Financial satisfaction, defined as satisfaction with one's present financial situation, is an important determinant of overall individual well-being (Joo and Grable, 2004; Plagnol, 2011). Most importantly, financial satisfaction may also change individuals' perception about dishonesty. As shown by Sharma *et al.* (2014), financial deprivation influences the acceptability of immoral conduct and this eventually compromises moral decisions. We expect that people more satisfied with their financial status might be less willing to justify dishonest actions; conversely, those who are less financially satisfied might cheat more as an attempt to improve their financial positions. Therefore, in estimating the

impact of the financial satisfaction on cheating behavior we face an issue of reverse causality; we deal with the potential endogeneity of financial satisfaction through the instrumental variable approach.

We enrich the analysis by considering the association between "love of money" and cheating attitudes. People who value money highly are more likely to exhibit personality traits such as sensation seeking, competitiveness and materialism, which may be positively related with cheating behavior (Kirkcaldy and Furnham, 1993). Money beliefs and values vary across individuals. Besides its objective functions, money owns affective, symbolic and behavioral meaning, as it is associated to individuals' identity and self-concepts (Mitchell and Mickel, 1999). Therefore, the more an individual agrees that money is important, the more she might find acceptable some questionable consumer activities (Vitell *et al.*, 2007).

We further investigate the association between being trusting and attitudes towards cheating. According to Uslaner (1999) decisions to behave morally depend on how people expect others to act and on personal values, as they foster individuals' ethical standards of behavior.

We combine the analysis of the determinants of cheating with the line of research on the relationship between financial literacy and financial behavior. According to previous findings, those who are more knowledgeable in financial matters have a better understanding of financial products, they are more likely to invest in risky assets and they save more for precautionary reasons (Van Rooij *et al.*, 2011; de Bassa Scheresberg, 2013). Individuals who are financially knowledgeable are also less likely to incur in high-transaction costs or expensive borrowing methods (Lusardi and Tufano, 2015); furthermore, using Dutch data, Alessie *et al.* (2011) demonstrate the positive causal effect of financial literacy on retirement preparation. Overall, financial knowledge has positive implications on several aspects of financial behavior. In this research, we focus on the role of financial literacy in influencing individuals' satisfaction with their financial position to estimate the causal effect of financial wellbeing on consumers' misbehaviors.

We use Dutch data from the Longitudinal Internet Studies for the Social Sciences (LISS) panel, a longitudinal household survey based on a true probability sample of households living in the Netherlands. Our final sample consists of 1,228 observations for individuals who completed the questionnaire in year 2012.

Our research contributes to the existing literature in three main directions. First, we look at a new potential determinant of individuals' attitudes towards dishonesty, namely financial satisfaction. Second, we consider multiple dimensions of cheating behavior: besides

the analysis of tax evasion, which has been widely explored in earlier studies (Grundmann and Lambsdorff, 2017; Torgler, 2006; Robben *et al.*, 1990), we investigate the probability of claiming government benefits without any rights, stealing property, accepting a bribe and engaging in ordinary dishonest actions, such as travelling on buses without a valid ticket. Tax evasion has been mainly analyzed as a problem of choice under uncertainty (Allingham and Sandmo, 1972); people compare the benefit of lower fiscal burdens with the cost of punishment in the event they were caught (Gneezy, 2005). The costs associated with tax evasion are not only monetary; behaving illegally has high moral costs that arise from the feeling of shame about evading (Torgler and Schneider, 2007; Bosco and Mittone, 1997). Several factors might also determine individuals' decisions about cheating on government benefits. The Dutch government provides a number of welfare benefits, such as healthcare allowances, rent benefits or childcare assistance for citizens and residents in the Netherlands. People who deliberately apply for government benefits to which they are not entitled are committing fraud. The other unethical behaviors considered in our work do not provide large financial benefits to individuals but still have large social and economic consequences (Bucciol *et al.*, 2013). Finally, as a third contribution, we estimate the causal impact of the financial satisfaction on cheating behavior by using two indices of financial literacy as instruments to deal with the potential endogeneity of financial satisfaction.

Our findings show that the financial satisfaction is a significant determinant of cheating towards the government, like benefits fraud or tax evasion. While those who are more satisfied with their standards of living are less likely to justify claiming government benefits without any right, we find a positive effect of financial satisfaction on the propensity to accept tax evasion. By contrast, an improvement in financial satisfaction does not make individuals less likely to justify stealing property and fare evasion. We show that these components of cheating are mainly affected by personal characteristics and individual attitudes towards money. Most importantly, we find a strong and significant role of risk aversion in reducing the acceptability of these unethical actions. Interestingly, we find that both financial satisfaction and risk aversion are significant drivers of tolerance towards bribery. Therefore, decisions to behave dishonestly do not result only from financial advantages: financial satisfaction and risk aversion have different and independent impacts on individuals' tolerance towards dishonesty.

In addition, we show that those who value money highly are more willing to justify all our cheating outcomes, except for benefits fraud; conversely, being trusting is significantly and negatively associated with all forms of misbehavior considered in our analysis.

The remainder of the paper is structured as follows: Section 2 introduces the data, together with the econometric model and the relevant variables used in the analysis. We present our main findings in Section 3. Section 4 provides several robustness checks. The last Section concludes, discussing implications of this research as well as some ideas for further extensions.

2. Data

2.1. LISS Core Study and Assembled Studies

In our research we use Dutch data from the LISS (Longitudinal Internet Studies for the Social sciences) panel. The LISS panel is based on a sample of the population registered by Statistics Netherlands. One member in the household provides the household data; households without the necessary technological infrastructure are provided with a computer and Internet connection. Survey data are collected by CentERdata (Tilburg University, The Netherlands). The survey is organized in eight modules, which cover questions on family and income, economic situation, work and schooling, social integration, health, personality, religion and ethnicity, politics and values. CentERdata provided all study data to the authors in an anonymized format.

In addition to the LISS Core Study, we consider data from two additional modules connected to the LISS core study: *World Values Survey* and *Financial Literacy*. The former is the Dutch version of the original survey administered to the panel members in December 2012; from here we obtain our measures of cheating, which we use as dependent variables in the analysis, and several additional variables that we relate to cheating behavior. The second one is a single wave study administered to the LISS panel in August 2011. It consists of 5 questions:[1] the first one is on self-assessed financial knowledge, while the other four test the respondent's knowledge of financial concepts (i.e. interest rate, inflation, diversification, relationship between interest rate and bond prices) and can be used to build an index of financial literacy.

We use information from the LISS Core Study for respondents who completed the questionnaire in year 2012, when data about cheating behavior have been collected; the background variables are selected on the same month as the dependent variables used in our analysis. After combining these data with those from the assembled studies, we select participants in the economically relevant age range 18-80; this leaves a sample consisting of

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[1] The precise wording of these questions is reported in Appendix A.1.

8,008 observations. In doing our analysis, we consider information that are no missing for respondents who participated in all the surveys mentioned above. Our final sample consists of 1,228 observations.[2]

2.2. Econometric model

In performing our analysis we consider several determinants of unethical behavior and we focus on the relation between cheating attitudes and individuals' financial satisfaction. The equation we estimate is specified as follows:

$$c_i = \beta_0 + \beta_1 finsatisfaction_i + \beta_2 lovemoney_i + \beta_3 generaltrust_i + X_i'\beta_4 + F_i'\beta_5 + \varepsilon_i \quad (1)$$

where c_i represents the outcome variables on cheating attitudes for individual i (benefits fraud, tax evasion, fare evasion, stealing property and bribery) and ε_i is the error term.

The focus of our analysis is on *financial satisfaction*, as we believe that it might have a strong influence on individuals' perception about dishonesty: people who experience financial hardship might be more likely to justify cheating behaviors. Financial dissatisfaction increases individuals' willingness to cheat for financial gains, as shown in the literature on subjective wellbeing or moral hypocrisy (Barden *et al.*, 2005; Stone and Fernandez, 2008; Sharma *et al.*, 2014). At the same time, those who are more satisfied with their standards of living could be less willing to justify dishonest behavior. As individuals' perceptions about cheating eventually compromise their practical conducts, we want to explore this issue in our data.

In addition, we look at the role of *love of money* and *general trust* on attitudes towards cheating.

Recent literature has examined how love of money relates to unethical behavior. People with high love of money are those who want to be rich and consider money as an important symbol of success (Tang and Liu, 2012). We argue that materialistic people, who value money highly, may be more likely to tolerate dishonest actions that provide financial gains.

We also investigate the association between being trusting and tolerance towards cheating. Opinions about morality largely depend on how people expect others to act. We expect that people who trust others attach greater importance to social connections and they

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[2] The number of complete observations for the variable representing bribery is 1,212. Descriptive statistics about the complete sample are similar to those reported in our analysis, supporting the representativeness of our data. Some differences arise in the percentage of married and religious people, who are slightly overrepresented in the final sample.

are more likely to put personal interest aside; therefore, they may be more willing to behave correctly.

The other variables included in our analysis can be grouped in two vectors: X_i' and F_i'. X_i' refers to a vector of explanatory variables that comprises socio-demographic controls and a measure of risk aversion. F_i' is a vector of further control variables that we choose from the broader literature on consumer misbehavior; we include these variables in our specifications as a robustness check.

For each binary dependent variable,[3] we present estimations from a linear probability model with heteroskedasticity-consistent standard errors. However, we cannot simply rely on these estimates to assess the causal effect of financial satisfaction on cheating, as we may face a problem of reverse causality: whilst individuals' financial satisfaction determines their attitudes towards unethical behavior, it is also true that cheating might be performed with the purpose of improving financial satisfaction. Specifically, government subsidies are mainly granted to citizens in difficult financial conditions, which might improve after receiving financial support. The same is true when considering the propensity to cheat on taxes. Benefits fraud and tax evasion have a significant impact on the size of the shadow economy; people may engage in fraudulent activities towards the government with the purpose of improving their financial conditions. This implies that the coefficients estimated by these models might be biased; we deal with the problem of endogeneity by using our indices of financial literacy as instruments.

We compare our estimates with those from a linear 2SLS model. Despite ignoring the binary nature of the outcome variables, it is widely used in the literature and supported by much real-world experience (Wooldridge, 2008; Angrist and Pischke, 2009); moreover, it is easily interpretable, and it allows us to test for the validity of our instruments.[4]

The choice of using financial literacy as an instrument is justified by the following reasons: first, there is considerable evidence suggesting that financial knowledge has a positive impact on individuals' financial satisfaction (Joo and Grable, 2004). Gerrans *et al.* (2014) show that financial knowledge provides financial satisfaction, which in turn is a predictor of personal wellbeing. In addition, financial literacy fosters the capacity to deal with financial emergencies and it increases the possibility of accumulating wealth (Lusardi *et al.*, 2011). For instance, Bernheim *et al.* (2001) report an increase in the accumulation of assets

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[3] Please refer to Sub-section 2.3.1 for more details about the construction of our key variables.

[4] We re-estimate our equations using probit and IV probit models to specifically account for the binary nature of the dependent variables; results are provided in Appendix B.

over time in countries where students were exposed to financial curricula during high school. Hence, we expect that saving allows individuals to improve their financial satisfaction. Based on this evidence, we claim that financial knowledge has a positive impact on individuals' financial satisfaction. Second, it might be argued that those who display deeper legal and financial knowledge are also aware of how to act strategically in order to cheat. Indeed, we may expect that those who are capable to exploit their knowledge to be financially successful might be particularly prone in disregarding others' interests by acting immorally. However, if this argument might hold for dishonest actions performed against institutions, such as tax evasion or benefits fraud, it does not apply to the other measures of cheating, which do not require specific financial knowledge. Moreover, those who, in our sample, display greater financial knowledge cannot be defined as "experts" in financial fields; knowledge of simple economics concepts, like those considered to create our indices, are not so sophisticated as to allow individuals to exploit them in order to cheat. Finally, our measures of cheating are not gauging actual behavior of individuals, but their tolerance towards some questionable actions; in our opinion, the justifiability of unethical behaviors considered in this study is mainly influenced by personal values and socio-economic conditions, rather than by individuals' knowledge of financial concepts. Therefore, we assume that our indices of financial literacy are not directly related to individuals' tolerance towards cheating.

2.3. Definition of the key variables

2.3.1. Cheating measures

We obtain our indirect measures of cheating from the World Values Survey (LISS Panel version). Respondents are asked to indicate on a scale from 1 (*Never*) to 10 (*Always*) whether they justify or not some actions, among these: "*Claiming government benefits to which you are not entitled*", "*Avoiding a fare on public transport*", "*Stealing property*", "*Cheating on taxes if you have a chance*" and "*Someone accepting a bribe in the course of their duties*".[5]

However, it should be noted that our dependent variables display very low variability, as most of respondents report they do not justify at all the dishonest behaviors described in the survey. It could be that interviewed people might under-report their real tendencies towards cheating, given the sensitive nature of the information asked. Thus, observations are not equally distributed across the entire scale: for each dependent variable used in the analysis,

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[5] The precise wording of these questions is reported in Appendix A.2.

the largest concentration of responses is on point 1 on the corresponding Likert-scale.[6] To get enough variation from individuals' responses, we aggregate the other scaling items into one, which represents the overall acceptability of the specific unethical behavior. Therefore, we model our dependent variables as dichotomous ones, taking value one if respondents justify, even to a small extent, an incorrect behavior on the specific action (points 2 to 10 on the scale), and zero otherwise.

2.3.2. Determinants of cheating behavior

Financial satisfaction

We measure financial satisfaction from the income questionnaire of the LISS Core Study; respondents are asked to report their satisfaction with their financial situations on a Likert-scale ranging from 0 *(Not at all satisfied)* to 10 *(Entirely satisfied)*.

It should be recalled that compliance with social norms is also influenced by economic factors such as changes in prices or available income (Halla and Schneider, 2014). The level of income provides objective information about respondents' financial position; conversely, our measure of financial satisfaction is described by the satisfaction with one's current financial status, which might be related to consumer choices, job productivity and marital stress (Joo and Grable, 2004). Both financial satisfaction and income might affect our dependent variables, but they are also correlated to each other. In particular, we expect the financial satisfaction over life resembles the life course pattern of income (Plagnol, 2011). In line with this, Dolan *et al.* (2008) find that financial satisfaction mediates the effects of objective circumstances (i.e. income or financial status) on individuals' measure of personal wellbeing; again, Hira and Mugenda (2000) find that those who have higher household income and save more are more likely to report higher financial satisfaction.

Our benchmark analysis is eventually based on the effect of financial satisfaction.[7] According to previous literature, subjective values and ethical principles have a deeper impact on moral behavior compared to other socio-demographic determinants (Uslaner, 1999). Dishonesty is not only driven by economic incentives; that it is why people usually engage in some levels of cheating, without updating completely their own morality (Shalvi *et al.*, 2011). The huge importance attached to subjective components in influencing cheating behavior

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[6] See figure A.1 in Appendix A.2.

[7] Appendix Table D.4 reports OLS estimates with household income as an additional explanatory variable; results are consistent.

justifies our choice of focusing on financial satisfaction; it reflects the interviewee's feelings and satisfaction about her personal financial position, so we expect a greater effect of this subjective variable on individuals' attitudes towards dishonesty.

Love of money

We measure money love of the respondent by considering her agreement on the following item of the World Values Survey (LISS Panel version): *"It is important to this person to be rich; to have a lot of money and expensive things".* This is a short description of another person. Respondents are asked to indicate whether they are similar to that person on a likert scale ranging from 1 (*"not at all like me"*) to 6 (*"very much like me"*). Our measure of *"love of money"* is a dummy variable equal to one if the respondent provides an answer greater than or equal to the third tier (from "a little" to "very much" like her), and zero otherwise.

General trust

We measure the level of trust of individuals through the agreement on the following statement of the World Values Survey (LISS Panel version): *"I see myself as someone who is generally trusting".* We model *"general trust"* as a dummy variable equal to one if the respondent indicates that she strongly agrees with this sentence, and zero otherwise.[8]

2.3.3. Instruments: financial literacy

Financial literacy is generally measured through three questions about key financial concepts (interest compounding, inflation, risk diversification). These questions were first administered in a special module for the 2004 US Health and Retirement Study and they were added to other international surveys thereafter (Lusardi and Mitchell, 2014). The assembled study administered to the LISS panel presents these three standard questions and an additional one on the relationship between interest rate and bond prices. Although the questions vary in difficulty, none of them requires expert financial knowledge as they are not excessively complex. This notwithstanding, previous researches suggest that consumers' knowledge of basic financial principles is very low; individuals who lack financial knowledge might take suboptimal financial decisions, as they do not plan for retirement, they rely more on informal

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[8] Results qualitatively do not change when we reproduce our analysis by keeping the whole scale for both the dependent variables and all the main regressors (financial satisfaction, love of money and general trust).

sources of financial information and they also borrow at higher costs (Lusardi and Mitchell, 2014).

Following Van Rooij *et al.* (2011), we perform a factor analysis on the financial literacy questions. We first define a dummy variable for the correct answer to each question. Consistently with previous literature, we create another dummy if the respondent states that she did not know the answer to the question; exploiting information from such a response is necessary in measuring financial literacy, as it characterizes individuals who know the least (Lusardi and Mitchell, 2011). We combine financial literacy information on an index by performing the factor analysis with the principal component method. From this procedure we obtain two factors: one has heavy loadings on the simplest literacy questions, while the other is more heavily loaded on those about diversification and the relationship between interest rates and bond prices. Therefore, we retain two factors underlying the level of basic and advanced financial literacy, respectively. Barlett's test of sphericity (p<0.001) indicates that it is appropriate to use factor analysis. We assume that financial knowledge does not change between 2011, when the additional module on financial literacy has been administered, and 2012; while financial education provided at school might increase financial knowledge and skills of young individuals, we expect that financial literacy is rather stable among adults, who constitutes the great majority of our sample.[9]

2.3.4. Control variables

Recent literature provides mixed evidence on the factors that mainly affect cheating behavior. The role of gender in influencing dishonest behavior has been investigated by Friesen and Gangadharan (2012), who find that men exhibit greater propensity to behave dishonestly, compared to women; in line with this, Crown and Spiller (1998) find that cheating behavior among males is significantly higher. Conversely, Ezquerra *et al.* (2018) report no gender difference in cheating once these are tested using the dice-paradigm. It could also be that males are more likely to report that they engaged in past cheating behaviors compared to females (Smith *et al.*, 2002). Other studies suggest that gender differences arise only when interpersonal relationships are involved, while men and women display in the same way when dishonest actions are non-relational. We expect that gender is a significant predictor of ethical behavior; therefore, we decide to control for this variable in our specifications. The effect of age is also relevant. Diekhoff *et al.* (1996) find that younger

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[9] We repeat our analysis by considering only respondents older than 25, as individuals in this age range should have completed their educational path, achieving a stable level of knowledge; results are consistent.

students cheat more than their older peers; Kelley *et al.* (1990) show that age positively influences ethical behavior, as individuals develop a greater understanding of honesty as they grow up. Similarly, Peterson *et al.* (2001) find that older people possess higher ethical principles and that gender differences decrease as people grow older. In the context of tax evasion, Torgler (2006) finds that being married correlates negatively to cheating behavior; married people or those with children are more constrained by their social networks, so they might be more oriented to comply with social norms to maintain respectable social positions. Occupational status and education may also influence tolerance towards cheating. As an example, workers who are self-employed have greater opportunities to underreport their incomes to pay less taxes, compared to individuals who are employed on a contractual basis.

Based on this short discussion, we include several socio-demographic indicators as control variables in our specifications. We add an indicator for the level of urbanization of respondents' place of residence, which is also useful to capture area fixed effects. Finally, we consider a dummy variable to account for risk aversion; as people's unethical behaviors involve some risks, we argue that individuals who are more risk averse are also less likely to cheat (Eishenauer *et al.*, 2011).

2.3.5. Descriptive statistics

Table 1 provides summary statistics on the relevant variables used in our analysis. The averages of the dependent variables are rather low. In particular, about 13% of individuals consider acceptable to claim not entitled government benefits and 9% of them justify dishonest behavior regarding property stealing. The percentage of individuals who accept fare evasion is higher (35%); it can be considered as less serious compared to other dishonest behaviors. Cheating on taxes is what could provide the greatest monetary benefits; it is justified by about 37% of the sample. 17% of individuals claim to tolerate bribery. The average age of the respondents is 54, about 52% are women and 9.7% of the individuals have college education. More than half of the individuals are married and 41% of them live in a highly urbanized area. Overall, 43.6% of respondents are employees, while self-employed individuals constitute only 3.3% of our sample. In our sample, 23.4% of the individuals consider money and wealth to be important and most of them state to be financially satisfied, with an average of 6.7 out of 10; 41% of respondents declare to be generally trusting. As expected, knowledge of basic financial concepts is higher (88.2%) than the average level of advanced financial knowledge (37.3%).

Table 1. Descriptive statistics

	Mean	**Std.Dev.**	**Min**	**Max**
Dependent variables				
Benefits fraud	0.129	0.336	0	1
Tax evasion	0.367	0.482	0	1
Fare evasion	0.353	0.478	0	1
Stealing property	0.093	0.290	0	1
Bribery	0.172	0.377	0	1
Socio-demographic characteristics				
Age	54.168	15.33	18	80
Female	0.519	0.500	0	1
Number of children	0.563	0.987	0	6
Married	0.542	0.498	0	1
Place of residence: high urban (population density per square kilometer≥1500)	0.410	0.492	0	1
Employee	0.436	0.496	0	1
Self-employed	0.033	0.180	0	1
College	0.097	0.296	0	1
Household monthly income	2,515.103	1,524.057	0	13,500
Main regressors				
Love of money	0.234	0.423	0	1
Financial satisfaction	6.700	1.786	0	10
General trust	0.410	0.492	0	1
Instrumental variables				
Basic financial literacy	0.882	0.182	0.015	1
Advanced financial literacy	0.373	0.270	0	0.874
Further control variables				
Risk aversion	0.598	0.490	0	1

Notes: data are from 2012 LISS Core Study and from the additional modules *World Values Survey* and *Financial Literacy*. The final sample consists of 1,228 observations.

3. Results

3.1. Cheating towards the government

We first discuss the impact of financial satisfaction on benefits frauds and tax evasion; these outcomes represent tolerance of cheating towards the government.

Regression results from different specifications of Equation (1) are reported in Table 2. For each dependent variable considered in this section, we present the results from the linear probability model (Columns 1 and 3) and from instrumental variables estimations,

where financial satisfaction has been instrumented using our two indices of financial literacy (Columns 2 and 4).

Table 2. Cheating towards the government

	(1)	(2)	(3)	(4)
	Benefits fraud		**Tax evasion**	
	OLS	IV	OLS	IV
Financial satisfaction	-0.016***	-0.088***	0.009	0.093**
	(0.006)	(0.032)	(0.008)	(0.039)
Love of money	0.037	0.040	0.096***	0.093***
	(0.026)	(0.027)	(0.035)	(0.036)
General trust	-0.049***	-0.057***	-0.086***	-0.077***
	(0.019)	(0.020)	(0.027)	(0.029)
Age ≤ 30	0.076	0.028	-0.057	-0.002
	(0.048)	(0.056)	(0.061)	(0.068)
Age 31-65	0.034	-0.031	-0.013	0.062
	(0.025)	(0.038)	(0.040)	(0.055)
Female	-0.023	-0.029	-0.121***	-0.114***
	(0.020)	(0.021)	(0.028)	(0.029)
Number of children	0.016	0.002	-0.002	0.013
	(0.011)	(0.013)	(0.015)	(0.017)
Married	-0.012	0.028	-0.027	-0.073*
	(0.021)	(0.028)	(0.029)	(0.038)
High urban	-0.001	-0.007	-0.057**	-0.051*
	(0.020)	(0.021)	(0.028)	(0.029)
Employee	0.011	0.061*	-0.017	-0.076*
	(0.025)	(0.035)	(0.034)	(0.045)
Self-employed	0.042	0.077	0.054	0.014
	(0.067)	(0.073)	(0.078)	(0.087)
College	0.018	0.050	-0.017	-0.055
	(0.036)	(0.040)	(0.048)	(0.052)
Risk averse	-0.031	-0.020	-0.035	-0.047
	(0.021)	(0.022)	(0.029)	(0.031)
Constant	0.242***	0.727***	0.461***	-0.108
	(0.049)	(0.220)	(0.068)	(0.271)
Observations	1,228	1,228	1,228	1,228
R-squared	0.036		0.047	
F-statistic		18.310		18.310
Sargan test p-value		0.635		0.615
Exogeneity test p-value		0.013		0.021

Notes: this table presents coefficient estimates on cheating towards the government using OLS (Columns 1 and 3) and IV (Columns 2 and 4) regression models. Heteroskedasticity-consistent standard errors are in parentheses. ***, **, * denote significance at the 1 percent, 5 percent, and 10 percent levels, respectively. Reference categories are: age>65 (age), not employed (occupation), less than high school (education).

According to Column 1 of Table 2, an improved financial satisfaction is associated with a lower propensity (1.6 percentage points) of accepting incorrect behaviors related to government benefits. As expected, financial satisfaction influences people's perceptions about morality; individuals who are more satisfied with their standards of living are more critical in judging dishonest behaviors. Conversely, the results reported in the third column of Table 2 show that the correlation between financial satisfaction and the probability to accept tax evasion is not statistically significant.

However, as argued earlier, these estimates cannot be interpreted causally. Benefits fraud and tax evasion might provide individuals with large monetary payoffs, improving their financial conditions. This suggests that the effect of financial satisfaction on these outcomes is endogenous as we face an issue of reverse causality.

We account for the potential endogeneity of financial satisfaction by using our indices of financial literacy as instrumental variables. We employ our two indices of financial literacy to account for the endogeneity of financial satisfaction.[10] The Sargan test indicates no rejection of instruments' exogeneity and from the Hausman test we find evidence in favor of the endogeneity of financial satisfaction. The F-statistic is above the recommended value to avoid the weak instruments problem (Staiger and Stock, 1997).

The IV estimates in Column 2 of Table 2 show that the relationship between financial satisfaction and the propensity to cheat on government benefits remains negative and statistically significant at 1% significance level. We find that those who are more satisfied with their standards of living are less likely to justify claiming on government benefits without any right; however, the effect of financial satisfaction is even bigger in size compared to those provided by the model in Column 1. Therefore, after accounting for the endogeneity of financial satisfaction, we find that the effect of financial satisfaction in reducing incorrect behavior is above and beyond the one estimated by the linear probability model. The most interesting result arises when we consider the propensity to evade taxes as dependent variable; after accounting for the endogeneity of financial satisfaction, we find that people who are more satisfied with their financial positions are 9.3 percentage points more likely to accept tax evasion (Column 4). This effect is strongly significant from both a statistical and an economic perspective. Although we generally expect an inverse relationship between financial satisfaction and individuals' misconduct, we should notice that higher financial satisfaction is generally associated with greater income levels; the rich might display lower tax morale

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[10] Appendix C reports results for the tests of our instruments.

because their compliance implies a greater loss of income. Public good games also confirm this result, as income has been found to be negatively correlated with fiscal contributions (Cherry *et al.*, 2005; Duch and Solaz, 2015).

Many researchers have discussed the effects of money on human behavior and considerable evidence shows that love of money may eventually cloud individuals' ethical attitudes (Tang and Chiu, 2003; Vitell *et al.*, 2007). While love of money is not a significant determinant of the first measure of cheating considered in Table 2, our results on tax evasion provide evidence of a positive association between love of money and tolerance towards tax evasion. This correlation is quantitatively large, as love of money increases the propensity to cheat on taxes by 9.3 percentage points (Column 4). In line with Torgler (2003), results from Table 2 suggest that decisions on tax compliance are also influenced by moral attitudes.

Interestingly, the correlation between being trusting and tolerance towards cheating is strongly significant and negative for all the specifications reported in Table 2; in particular, being trusting decreases the propensity of justifying benefits fraud and tax evasion by 5.7 and 7.7 percentage points, respectively (Columns 2 and 4). A possible explanation is that people who trust others believe that peers would not act contrary to their own interests; they might be more likely to behave honestly, putting self-interest aside (Uslaner, 1999).

The impact of socio-demographic characteristics on the propensity to claim government benefits without any right is not overall significant when we consider the instrumental variables estimates (Column 2). This might be related to the lower precision of the IV estimates, as indicated by larger standard errors reported in Columns 2 and 4 of Table 2.

However, when we consider the last specification reported in Table 2, we find that being female, married or living in a high urban city have a significant negative effect on the propensity of justifying tax evasion. Our findings are in line with previous literature showing that women exhibit greater propensity to comply with tax payments, consider the fiscal system as fairer and overestimate the penalties for tax evasion (Kinsey, 1992; Rosenbaum *et al.*, 2014). Moreover, married people might be more likely to comply with social norms because they face greater social constraints (Torgler, 2006). Interestingly, those living in highly urbanized areas are less likely to accept tax evasion. It may be that good institutions increase citizens' well-being, making them more likely to comply with fiscal rules; the costs of illegal activities might be perceived as higher for people living in highly urbanized areas also for the presence of greater institutional accountability (Torgler and Schneider, 2007).

3.2. Other forms of cheating

Besides the components of cheating analyzed in the previous Sub-section, there are other forms of dishonesty that are extremely costly for the society. Some examples are stealing from one's employer, illegally downloading music from the web, cheating on an exam or using public transportation without paying the ticket. In our analysis, we consider fare evasion, property stealing and bribery as expressions of other forms of dishonesty; Table 3 reports regression results from Equation (1) for these cheating outcomes.

According to the Hausman test, the OLS estimates do not differ significantly from the IV estimates; the exogeneity of financial satisfaction is not rejected. The assumption of instruments exogeneity finds statistical support in Sargan test of the overidentifying restrictions.[11] For this reason, we rely on the linear probability model to discuss the effects of our regressors on the dependent variables under considerations. Indeed, the financial gains arising from these forms of cheating are probably not substantial enough to impact the financial satisfaction of the cheater. Estimation results from the OLS regressions are presented in Table 3.[12]

Table 3. Other forms of cheating

	(1) Fare evasion OLS	(2) Stealing property OLS	(3) Bribery OLS
Financial satisfaction	0.001	-0.004	-0.012*
	(0.008)	(0.004)	(0.007)
Love of money	0.057*	0.043*	0.053*
	(0.034)	(0.023)	(0.030)
General trust	-0.093***	-0.047***	-0.038*
	(0.026)	(0.016)	(0.021)
Age: below 30	0.218***	0.074*	0.172***
	(0.059)	(0.041)	(0.057)
Age: below 65	0.049	0.047**	0.029
	(0.037)	(0.022)	(0.029)
Female	0.010	-0.013	-0.103***
	(0.027)	(0.016)	(0.022)
Number of children	0.030*	0.010	-0.001
	(0.015)	(0.010)	(0.012)
Married	-0.059**	0.019	-0.022
	(0.029)	(0.017)	(0.023)

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[11] Sargan test statistic of overidentifying restrictions for the variable "fare evasion" is equal to 0.480 with a p-value of 0.488. It is equal to 1.222 with a p-value of 0.270 for the variable "property stealing". As regards "bribery", the test statistic is equal to 0.381 with a p-value of 0.537.

[12] Regression results for the corresponding IV estimates are available upon request.

High urban	0.034	0.008	-0.027
	(0.027)	(0.017)	(0.021)
Employee	0.088***	-0.006	-0.007
	(0.034)	(0.022)	(0.028)
Self-employed	0.059	-0.057	-0.006
	(0.079)	(0.048)	(0.067)
College	0.079	0.041	-0.011
	(0.048)	(0.036)	(0.039)
Risk averse	-0.106***	-0.061***	-0.052**
	(0.029)	(0.019)	(0.024)
Constant	0.329***	0.117***	0.333***
	(0.067)	(0.038)	(0.057)
Observations	1,228	1,228	1,212
R-squared	0.091	0.043	0.062

Notes: this table presents coefficient estimates on other forms of cheating using OLS regression model. Heteroskedasticity-consistent standard errors are in parentheses. ***, **, * denote significance at the 1 percent, 5 percent, and 10 percent levels, respectively. Reference categories are: age>65 (age), not employed (occupation), less than high school (education).

Those who state to be financially satisfied usually report higher savings and household income (Hira and Mugenda, 2000); therefore, we might expect that individuals who do not face financial constraints are less incentivized to cheat, especially for a low stake. However, we do not find evidence of a significant association between our measure of financial satisfaction and the propensity to accept fare evasion and property stealing, meaning that economic gains are not the most significant predictors of these forms of cheating.

In line with De Angelo *et al.*, (2016) we show that personal characteristics and preferences for decision making under uncertainty are more important in explaining variation in the acceptability of fare evasion and property stealing. Indeed, we find sizable and significant effects on money love and risk aversion. Even if fare evasion provides only a small benefit, as the cost of a bus ticket is generally small, we find that those who value money highly are 5.7 percentage points more likely to justify fare evasion on public transport (Column 1); this is in line with Delbosc and Currie (2016), who find that deliberate evaders believe it is acceptable to bend the rules to save money. The effect of love of money on the propensity to steal property is also positive and statistically significant; Column 2 of Table 3 shows that people who consider important to be rich are 4.3 percentage points more willing to accept this form of cheating.

Differences in risk aversion and in perceptions with respect to the probability of getting caught also affect the propensity to cheat. In line with Jing and Cheo (2013), we find

that risk aversion is negatively correlated with the propensity to accept fare evasion and property stealing. In particular, those who are more risk averse are 10.6 percentage points less likely to accept fare evasion on public transport and 6.1 percentage points less willing to steal property.

Results on general trust highlight that social interactions matters: being trusting decreases the propensity of justifying all the forms of unethical behavior considered in Table 3. It is possible that those who believe most people can be trusted identify themselves as part of a social group and develop strong mutual connections. In turn, shared group identity might enhance virtuous behaviors (Della Valle and Ploner, 2017).

Therefore, as stated by Fischbacher and Gächter (2010) analyzing free riding in public goods experiments, only a minority of individuals are motivated by pure income-maximization reasons; cooperation is determined by personal beliefs and, mainly, by expectations about peers' contribution.

Among the other forms of dishonesty considered in this subsection, bribery is the most closely related to cheating towards the government. Indeed, it is a form of corruption that might prevent the development of an efficient government system, as it often involves a misuse of public office for private gains (Dong *et al.*, 2012; Lee and Guven, 2013).

In line with our findings on benefits fraud, we show that an improved satisfaction with one's finances reduces the willingness to accept bribery by 1.2 percentage points. This result reinforces previous evidence by Van Rijckeghem and Weder (2001), who find that corruption may be reduced by increasing citizens' income. Moreover, as shown by Martin *et al.* (2007), financial constraints can increase firms' propensity to engage in bribery as a strategy for the achievement of goals. Therefore, financial satisfaction seems to be an important determinant of individual attitudes towards bribery.

However, the results reported in the last Column of Table 3 suggest that the acceptability of this unethical behavior partly depends on individuals' attitudes towards risk. Indeed, the propensity to accept bribery is reduced by 5.2 percentage points when individuals are risk averse, possibly because of the intense feeling of shame that would arise in the event of getting caught. Therefore, both financial satisfaction and risk aversion are significant drivers of tolerance towards bribery. Specifically, a respondent who is risk averse is as

likely to disregard bribery as an individual who is satisfied with her personal financial situation (Column 3).[13]

The standard analysis of free-rider problem assumes that people are rational and they weigh more personal interests than collective benefits (He, 2012). We show here that decisions to behave dishonestly do not result only from financial advantages: financial satisfaction and risk aversion have different and independent impacts on individuals' tolerance towards bribery.

In addition, we show that personal characteristics and individual attitudes towards money and risk aversion are the most significant predictors of the other forms of cheating, namely fare evasion and property stealing.

We find statistically significant effects of socio-demographic indicators on the propensity to engage in fare evasion, property stealing and bribery. We show that married respondents are less likely to accept fare evasion, as they might possess higher ethical principles and be more oriented to comply with social norms (Peterson *et al.*, 2001). Young respondents are more willing to accept all the forms of dishonesty considered in Table 3. Students or young workers represent the most significant market group in transit ridership; results on fare evasion are in line with Bucciol *et al.* (2013), who show through a field experiment that young individuals are more likely to travel without a valid ticket. These findings support previous literature indicating that younger people are more ethically permissive than older individuals, who possess higher moral values (Peterson *et al.*, 2001; Longenecker *et al.* 1989). We find that being an employee increases the acceptability of evading fares on public transport. Organ and Ryan (1995) argue that job attitudes are significant predictors of personal behavior in the field. Those who are employed on a contractual basis are usually affected by organizational choices made by other individuals belonging to the same organization; when supervisor's decisions are perceived as unfair, workers may try to restore fairness by indulging in dishonest behavior also outside organizational borders (Della Valle and Ploner, 2017). We show that females are 10.3 percentage points less likely than males to tolerate bribery, confirming previous results by Swamy *et al.*, (2001). Instead, we do not find a significant impact of education on the forms of cheating considered in Table 3. The overall impact of education on cheating attitudes is difficult to determine *a priori* (Ehrlich, 1975). Anwar *et al.*, (2017) find that the effect of education on unethical behavior depends on the way it changes the available opportunities to

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[13] The difference between the coefficient on financial satisfaction and the coefficient on risk aversion is not statistically significant as the p-value associated to the Chi-squared test is equal to 0.115.

offenders in several illegitimate activities. Further research is needed to clarify the relationship between education and cheating behavior; similar considerations hold for occupational status. Other control variables show insignificant impact on the same outcomes.

4. Robustness checks

4.1. The estimation model

The dependent variables used in our analysis are constructed by assigning a positive value when cheating is considered justifiable by the respondent, even to a small extent; conversely, the value 0 represents the extreme opinion "Never justifiable". We re-estimate our equations using probit and IV probit regression models to specifically account for the binary nature of the dependent variable; the estimates are provided in Appendix B. Results are very similar in sign and significance to those presented above, confirming the robustness of our findings.

4.2. The definition of the instruments

In the previous analysis, we have presented IV estimates by using two continuous instruments for one endogenous variable. As a robustness check, we estimate again our IV models with alternative binary instruments for financial literacy. The values of the financial literacy indices are mainly clustered towards the extremes of the distributions; therefore, we define a dummy variable equal to one if the respondent scores above the average level of basic and advanced financial literacy in the sample, respectively, and zero otherwise. Appendix Table D.1 shows that the effects of financial satisfaction, love of money and general trust are very similar, in terms of size and significance, to those previously estimated even when we consider two dummy variables as instruments. Our findings are consistent even when we consider only basic financial literacy as an instrument for the endogenous financial satisfaction. We state that knowledge of simple economics concepts is not so sophisticated as to be exploited by individuals to act immorally; this is even more valid when we focus on knowledge of basic financial concepts. Regression results in the case of exact identification are presented in Appendix Table D.2.

We also repeat our estimates by using the alternative identification strategy proposed by Lewbel (2012). Regression results are provided in Appendix Table D.3. Lewbel's method estimates structural parameters in regression models with endogenous variables by

constructing instruments as functions of the model's data.[14] Hence, the specification does not require external instruments to identify casual relationships. Results from Lewbel IV indicate that a greater satisfaction with personal financial position is negatively associated with the tolerance towards benefits fraud, whereas it is not relevant for the other forms of cheating, as mostly reported in Table 3. The effects of love of money and general trust are also consistent with the baseline results.

4.3. Endogeneity issues: reverse causality and general trust

Finding proper instruments is not easy, and we do not state that our choice entirely solves the endogeneity problems discussed above; for instance, it might still be argued that unobservable confounders may influence the relationship between financial literacy and individuals' financial satisfaction.[15] Notice, however, that our measure of financial literacy is lagged, so it should not be sensitive to the presence of omitted variables which can affect our specifications. By contrast, its effect on financial behavior might take time to realize, affecting individuals' financial satisfaction in the following year (when data for the main estimates have been collected). We perform an additional robustness check by implementing the "Generalized Sensitivity Analysis" as developed by Harada (2012), to test whether the relation between financial satisfaction and financial literacy is robust to potential unobserved confounders. The contour plot depicted in Figure 1 shows that the correlation between unobservable variables, financial literacy and situation would have to be much stronger than that of the included covariates to change the magnitude and the significance of our results. As it is difficult that we are omitting variables more highly correlated with financial satisfaction than age, gender, educational level and civil status, we conclude that our findings are robust to potential omitted factors.

We repeat the sensitivity analysis using alternatively "general trust" as assignment variable for the specification reported in Column 1 of Table 2.[16] Indeed, the presence of unobserved factors that affect both attitudes towards cheating and the willingness of being trusting might also cause endogeneity problems, including reverse causality. Nevertheless, Figure 2 shows that potential confounders should be much strongly correlated with general

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[14] Lewbel's approach exploits heteroskedasticity in the first-stage regression residuals to achieve identification. As it does not rely on standard exclusion restrictions, this estimation strategy may be useful in applications where traditional instruments are not available. For a more detailed description of this method see Lewbel (2012).

[15] However, the robustness of the causal relation between financial literacy and financial behavior has been already established in previous research (Lusardi and Mitchell, 2008).

[16] The algorithm can be applied to the other specifications as well.

trust and cheating than the included covariates to modify the causal interpretation of the results, confirming the robustness of our findings.

In addition, to deal with the potential endogeneity of general trust, which might affect the quality of our results, we repeat our estimates by omitting general trust from the original model. As Appendix Table D.5 shows, in all instances results on the effects of financial satisfaction and love of money are qualitatively the same, meaning that they are not too sensitive to the presence of general trust in the specification. This notwithstanding, in doing our analysis we are not claiming that general trust causes ethical behavior, since those who are trusting might be less tolerant towards dishonesty to begin with. Our results on the link between general trust and cheating might not reflect causation, but they are still interesting to shed more light on the factors that are correlated with individuals' tolerance towards unethical behavior.

Figure 1. Generalized sensitivity analysis
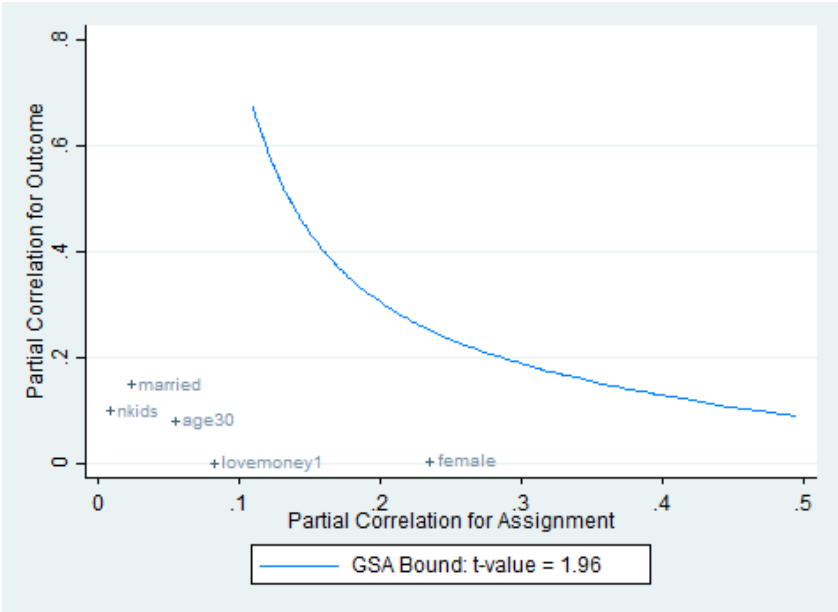
Notes: Generalized sensitivity analysis on the effect of advanced financial literacy (assignment variable) on individuals' financial satisfaction (outcome variable). Partial correlations are used as the axes of the contour plot. The target size of the t-value of the treatment variable is 1.96.

Figure 2. Generalized sensitivity analysis
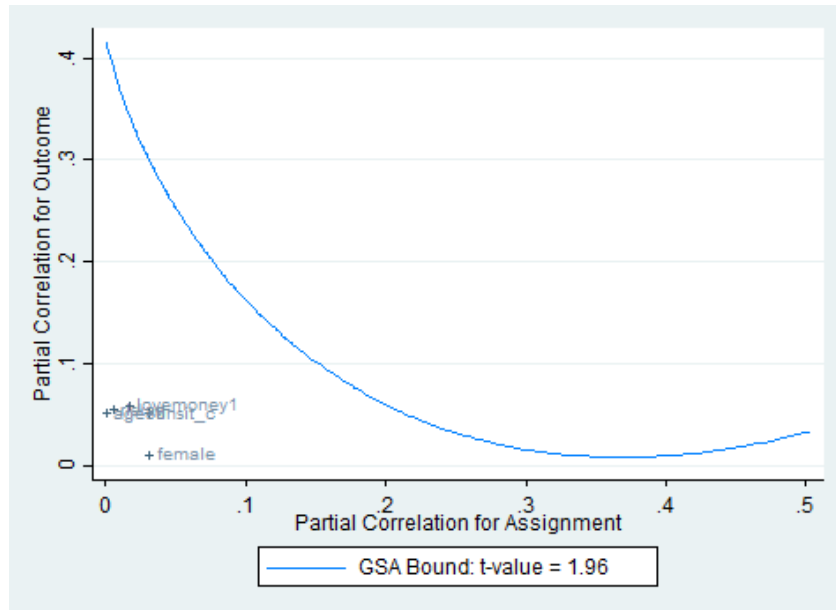
Notes: Generalized sensitivity analysis is performed on the model equation reported in Column 1 of Table 2. Being trusting constitutes the assignment variable. Partial correlations are used as the axes of the contour plot. The target size of the t-value of the treatment variable is 1.96.

4.4. *Additional determinants of attitudes towards cheating*

We control for additional determinants of cheating to limit the possibility that our results were driven by omitted variables. We do not include the whole set of control variables in the baseline specifications as we prefer a more parsimonious model, which increases precision of estimation.[17]

We control for the national origin of the respondent, as it might produce a sense of identification with her own country that encourages cooperative behavior; according to De Cremer *et al.* (2001) sense of belonging might increase citizens' level of social cooperation. We add another variable to represent religiosity, since it might encourage individuals to behave correctly by imposing moral constraints on their behaviors (Torgler, 2006). We consider a dummy variable equal to one if the respondent states to have high locus of control over her life, and zero otherwise. According to Verme (2009), freedom of choice and control are the best predictors of individuals' life satisfaction; previous literature provides evidence about the role of life satisfaction in influencing subjective well-being and happiness, which

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[17] The standard errors of the estimated coefficients slightly increase when we include additional control variables.

are positively related with ethics (James and Chymis, 2004; Bruni and Stanca, 2003). The other way around, Ferrer-i-Carbonell and Gërxhani (2016) identify a negative correlation between tax evasion and life satisfaction. Therefore, people with higher locus of control might be more satisfied with their own lives and, in turn, less likely to engage in unethical behaviors. We also include a variable equal to one if respondents consider important to learn values like tolerance and respect for other people, as proxy for moral principles. Finally, we control for trust in government, since individuals might be more likely to comply with rules of a State that acts trustworthily.

We report the new estimates in Table 4. We find that the effects of our main variables of interests (financial satisfaction, love of money and general trust) remain stable in sign and significance when we add the new variables and we include additional controls for educational attainments, confirming the robustness of our findings. The marginal effect of financial satisfaction is about the same as in the baseline estimations discussed above. The exogeneity test is not rejected when we consider the effect of financial satisfaction on fare evasion, stealing property and bribery. The effect of financial satisfaction on cheating on government benefits and on tax evasion is still consistent when we consider the instrumental variables approach.

Table 4. Robustness check: additional control variables

	(1) Benefits fraud IV	(2) Tax evasion IV	(3) Fare evasion OLS	(4) Stealing property OLS	(5) Bribery OLS
Financial satisfaction	-0.094**	0.091*	0.000	-0.000	-0.012*
	(0.040)	(0.049)	(0.008)	(0.005)	(0.007)
Love of money	0.036	0.096**	0.067*	0.044*	0.041
	(0.029)	(0.038)	(0.036)	(0.024)	(0.030)
General trust	-0.058***	-0.078**	-0.087***	-0.040**	-0.044**
	(0.022)	(0.031)	(0.028)	(0.016)	(0.022)
Dutch origin	0.029	-0.030	-0.023	-0.026	-0.033
	(0.039)	(0.052)	(0.037)	(0.024)	(0.030)
Believer	-0.003	-0.038	-0.046	-0.018	0.010
	(0.022)	(0.031)	(0.029)	(0.017)	(0.023)
Locus of control	0.006	-0.088**	-0.031	-0.057***	0.001
	(0.032)	(0.043)	(0.030)	(0.017)	(0.024)
Education: intermediate	-0.004	0.001	0.010	-0.004	-0.005
	(0.026)	(0.038)	(0.033)	(0.020)	(0.027)
Education:	-0.004	-0.012	0.007	0.005	-0.076**

high school					
	(0.040)	(0.055)	(0.053)	(0.032)	(0.037)
Trust in government	0.058	0.009	0.017	-0.003	0.076**
	(0.040)	(0.055)	(0.043)	(0.026)	(0.038)
Moral values	-0.067	-0.085*	-0.034	-0.067**	-0.150***
	(0.042)	(0.051)	(0.046)	(0.034)	(0.043)
Control variables	Yes	Yes	Yes	Yes	Yes
Observations	1,131	1,131	1,131	1,131	1,117
R-squared			0.089	0.059	0.087
F-statistic	10.952	10.952			
Sargan test p-value	0.252	0.629			
Exog. Test p-value	0.017	0.061			

Notes: All estimations include the same control variables as in Tables 2 and 3. The inclusion of further controls determines a reduction in the sample size due to missing values. Exogeneity test is rejected for "Benefits fraud" and "Tax evasion"; for these variables we report the corresponding IV estimates. Heteroskedasticity-consistent standard errors are in parentheses. ***, **, * denote significance at the 1 percent, 5 percent, and 10 percent levels, respectively. Reference categories are: age>65 (age), not employed (occupation), less than high school (education).

Our findings remain consistent even when we add household income as an explanatory variable in the OLS specifications. [18] Appendix Table D.4 shows that financial satisfaction is still negatively associated with the propensity to accept benefits fraud; conversely, it is not significantly related to the other measures of cheating. These findings are similar to those obtained in the baseline OLS regression models. The estimated coefficients on love of money and general trust also exhibit the same patterns.

5. Conclusions

We explore the effect of financial satisfaction on individuals' attitudes towards cheating by using Dutch data from the LISS panel. We analyze the impact of this variable both on dishonesty towards the government, such as benefits fraud or tax evasion, and on other forms of unethical behavior, such as fare evasion, property stealing and bribery. We rely on the role of financial literacy in influencing individuals' financial satisfaction as an instrument to assess the causal impact of financial satisfaction on the acceptability of unethical actions.

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[18] We consider a variable measuring net household income in Euros. We refer the reader to Appendix E.1 to shed more light on the correlation between financial satisfaction and some other factors that can affect individuals' financial condition, such as homeownership, assets or wages.

We find that those who are more satisfied with their standards of living are less likely to justify claiming on government benefits without any right. Interestingly, after accounting for the endogeneity of financial satisfaction, we show that people who are more satisfied with their financial positions are more likely to accept tax evasion, probably because fiscal compliance for wealthy individuals implies a considerable loss of income. This result also suggests that respondents are more willing to justify behaviors which give relatively more benefits and less damage to themselves.

By contrast, an improved financial satisfaction does not make individuals less likely to tolerate fare evasion and property stealing. The main assumptions underlying the analysis of free-rider problems are that people are rational and weigh more personal interests than collective benefits (He, 2012). In our analysis, we show that decisions to behave dishonestly do not result only from financial advantages: personal characteristics and individual attitudes towards money and risk aversion are the most significant predictors of these forms of dishonesty.

Interestingly, when we consider the acceptability of bribery as our dependent variable, we find that both financial satisfaction and risk aversion are important determinants of this unethical behavior.

The present research confirms previous evidence stating that love of money may eventually cloud individuals' ethical attitudes (Tang and Chiu, 2003; Vitell *et al.*, 2007). Conversely, being trusting decreases the propensity to justify all the cheating outcomes considered in our analysis.

One limitation of our study is that we can only measure attitudes towards cheating and not cheating behavior. As the data are self-reported data, they are obviously not free from bias (Swamy *et al.*, 2001). For example, the level of honesty measured in our sample is likely to overestimate the real one, because respondents might give socially acceptable answers. Moreover, we cannot completely exclude that different attitudes towards cheating may be caused by some time-invariant unobserved factors affecting also financial satisfaction. Some examples of these influences are respondents' intrinsic ability or family connections.

In an effort to mitigate omitted variable bias, further research may investigate the effect of ethical education received in early life on attitudes towards cheating. Knowing that parents have a strong influence on children's socialization and moral development (Houser *et al.*, 2016), it could be interesting to see whether those who internalized ethical concepts in the family environment are more likely to behave honestly throughout their life. A possible extension also concerns the relationship between financial satisfaction and love of money.

Specifically, one may think that the financial satisfaction may have a larger effect if respondents value richness relatively more. In Appendix E.2 we study how financial satisfaction and love of money interact to affect individuals' attitudes towards cheating.

We plan to expand this work also in another direction. We obtain our measure of cheating from the original World Values Survey, which explores values and beliefs of people in almost 100 countries. It could be interesting to repeat our analysis by comparing Western and Eastern countries, to see whether differences in culture and economic ideologies impact on cheating behavior. According to Gächter and Schulz (2016), the willingness to follow rules is widespread in countries which are more collectivist and present strong institutions. Conversely, people living in corrupted social environments, where cheating goes often unpunished, may increase their tolerance of dishonesty. Appendix Table E.3 reports cross-country data on the willingness to accept fare and tax evasion, respectively, from the original worldwide survey; answers are those from the same questions used in our analysis. As in Magnus *et al.*, (2002)[19] we consider cheating attitudes in US, Russia and Netherlands. In our analysis, we add two countries which are characterized by different standards of ethics: Italy and Sweden (Andrighetto *et al.*, 2016). Whilst honesty is a typical national trait in Sweden, Italy is ranked very low in terms of honesty amongst European countries (Daun, 1989; Mackie, 2001). We also report results for an emerging country like Indonesia; corruption is a significant problem in the developing world and individuals' opinions about cheating might vary according to the extent of dishonesty they see in their societies (Olken, 2007; Gächter and Schulz, 2016). From panel "a" of Appendix Table E.3, it emerges that 65.1% of Dutch people consider fare evasion as *"never justifiable"*; therefore, answers provided by the overall population in the Netherlands are in line with those obtained from the LISS Panel version of the original survey, where we have found that most respondents do not justify at all cheating behavior. By contrast, Russians are the most likely to accept small-scale dishonesty. Swedes seem to be less extreme in their judgements, as they spread their answers across the first three points of the likert-scales associated to both types of cheating behavior (panels "a" and "b"). Interestingly, Table E.1 indicates that countries like Indonesia and Italy, where we might expect to find higher tolerance of cheating behavior, are instead those that report the highest percentage of declared tax morality (panel "b"). These results partly contrast empirical evidence on the underground economy in Italy, which has been estimated to be considerably larger than in many other Western countries (Ardizzi *et al.*, 2012). Thus, further research

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[19] Magnus *et al.* (2002) compare cheating attitudes of students from different cultures, finding the highest level of honesty among students from the United States.

might address cross-country differences in attitudes towards cheating, as well as the impact of cultural factors and economic conditions on it.

Our analysis is useful to deepen our knowledge about the factors affecting individuals' tolerance towards cheating and, consequently, think of ways to limit it. We are aware that it is difficult to act directly on individuals' financial satisfaction; however, financial satisfaction may be considered a determinant factor of individuals' satisfaction with life in general. For this reason, knowing the existence of a strong association between financial literacy and financial satisfaction, it may be useful to promote effective education programs aimed at improving consumers' financial knowledge, as they may have positive consequences on their overall wellbeing too. We show that money love and trust in others also have significant impacts on personal opinions about cheating. Thus, it might be important to strengthen moral values and money beliefs among citizens, since they may affect individuals' ethical actions; improving social cooperation may also be an effective way to reduce tolerance towards dishonesty.

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Appendix A. Wording of Survey Questions

A.1. Financial literacy

Each question also allows "Do not know" and "Would rather not say" as possible answers.

"Suppose you have 100 euros on a savings account and the interest is 2% per year. How much do you think you will have on the savings account after five years, assuming that you leave all your money on this savings account?

1) more than 102 euros

2) exactly 102 euros

3) less than 102 euros

Suppose that the interest on your savings account is 1% per year and that inflation amounts to 2% per year. After 1 year, would you be able to buy more, exactly the same, or less than you could today with the money on that account?

1) more than today

2) the same as today

3) less than today

A share in a company usually offers a more certain return than an investment fund that only invests in shares.

1) true

2) not true

If the interest rate goes up, what should happen to bond prices?

1) they increase

2) they decrease

3) they stay the same

4) none of the above*"*

A.2. Outcome variables

Respondents are required to indicate on a scale from 1 to 10 to what extent they agree with the following statements. 1 means *"Never"*; 10 means *"Always"*.

"For each of the following actions indicate whether you think it can always be justified, never be justified, or something in between?

hz12a217 Claiming government benefits to which you are not entitled

hz12a218 Avoiding a fare on public transport

hz12a219 Stealing property

hz12a220 Cheating on taxes if you have a chance

hz12a221 Someone accepting a bribe in the course of their duties*"*

Figure A.1. Frequency distribution of responses (n=1,228)
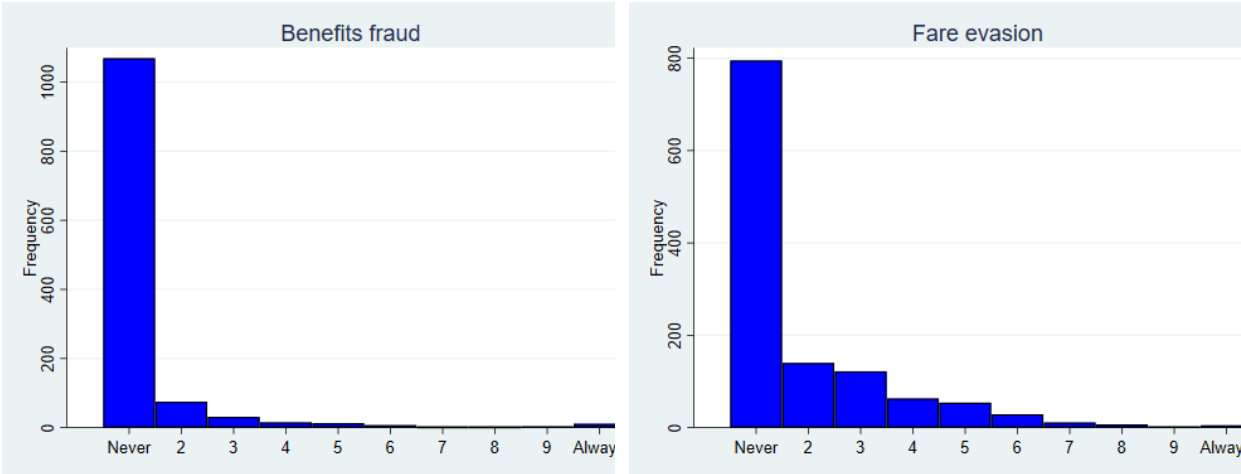
Notes: the figure reports the frequency distribution graphs of the variables representing benefits fraud (variable **hz12a217**) and fare evasion (variable **hz12a218**). Both variables present the largest concentration of responses on point 1 (*"Never"*) on the scale. The frequency distribution graphs of the other dependent variables are similar and available upon request.

Appendix B. Probit and IV probit

Table B.1. Cheating towards the government

	(1)	(2)	(3)	(4)
	Benefits fraud		**Tax cheating**	
	PROBIT	**IV PROBIT**	**PROBIT**	**IV PROBIT**
Financial satisfaction	-0.016***	-0.373***	0.010	0.266**
	(0.005)	(0.133)	(0.008)	(0.117)
Love of money	0.033	0.168	0.096***	0.250***
	(0.024)	(0.117)	(0.035)	(0.096)
General trust	-0.049***	-0.284***	-0.086***	-0.212***
	(0.019)	(0.104)	(0.027)	(0.081)
Age: below 30	0.083	0.164	-0.055	0.004
	(0.053)	(0.226)	(0.057)	(0.190)
Age: below 65	0.038	-0.073	-0.012	0.182
	(0.027)	(0.192)	(0.039)	(0.154)
Female	-0.023	-0.138	-0.120***	-0.305***
	(0.020)	(0.103)	(0.028)	(0.082)
Number of children	0.013	0.013	-0.002	0.041
	(0.010)	(0.057)	(0.015)	(0.049)
Married	-0.013	0.103	-0.027	-0.206*
	(0.020)	(0.129)	(0.029)	(0.106)
High urban	0.001	-0.019	-0.057**	-0.138*
	(0.019)	(0.101)	(0.028)	(0.081)
Employee	0.014	0.275*	-0.018	-0.219*
	(0.023)	(0.152)	(0.034)	(0.128)
Self-employed	0.044	0.341	0.049	0.016
	(0.060)	(0.270)	(0.081)	(0.234)
College	0.016	0.213	-0.017	-0.155
	(0.033)	(0.174)	(0.046)	(0.145)
Risk averse	-0.029	-0.098	-0.034	-0.131
	(0.020)	(0.106)	(0.029)	(0.085)
Observations	1,228	1,228	1,228	1,228
Log-likelihood	-450.943		-778.436	
Pseudo R-squared	0.047		0.036	
F-statistic		18.310		18.310
Sargan test p-value		0.495		0.529
Exogeneity test p-value		0.016		0.028

Notes: this table reports the marginal effects of the regressors estimated through probit (Columns 1 and 3) and IV probit (Columns 2 and 4) models on cheating towards the government. ***, **, * denote significance at the 1 percent, 5 percent, and 10 percent levels. Reference categories are: age>65 (age), not employed (occupation), less than high school (education).

Table B.2. Other forms of cheating

	(1) **Fare evasion** **PROBIT**	(2) **Stealing property** **PROBIT**	(3) **Bribery** **PROBIT**
Financial satisfaction	0.001	-0.004	-0.012**
	(0.008)	(0.005)	(0.006)
Love of money	0.055*	0.038*	0.049*
	(0.033)	(0.021)	(0.027)
General trust	-0.093***	-0.047***	-0.036*
	(0.026)	(0.016)	(0.021)
Age: below 30	0.216***	0.092*	0.172***
	(0.063)	(0.052)	(0.062)
Age: below 65	0.054	0.052**	0.030
	(0.038)	(0.022)	(0.030)
Female	0.010	-0.011	-0.103***
	(0.027)	(0.017)	(0.022)
Number of children	0.029**	0.009	-0.001
	(0.014)	(0.008)	(0.012)
Married	-0.061**	0.018	-0.020
	(0.028)	(0.018)	(0.023)
High urban	0.035	0.009	-0.026
	(0.027)	(0.017)	(0.021)
Employee	0.087***	-0.007	-0.006
	(0.033)	(0.019)	(0.026)
Self-employed	0.061	-0.042	-0.011
	(0.078)	(0.032)	(0.056)
College	0.073	0.035	-0.007
	(0.047)	(0.030)	(0.035)
Risk averse	-0.102***	-0.058***	-0.050**
	(0.027)	(0.017)	(0.022)
Observations	1,228	1,228	1,212
Log-likelihood	-739.717	-353.079	-519.043
Pseudo R-squared	0.072	0.069	0.066

Notes: this table reports the marginal effects of the regressors estimated through probit models on other forms of cheating. ***, **, * denote significance at the 1 percent, 5 percent, and 10 percent levels. Reference categories are: age>65 (age), not employed (occupation), less than high school (education).

Appendix C. Postestimation tests

Table C.1. Tests of the instruments

First stage- dependent variable: financial satisfaction					
Basic financial literacy	1.596***				
	(0.342)				
Advanced financial literacy	0.856***				
	(0.192)				
Other regressors not reported					
	Benefits fraud	Tax evasion	Fare evasion	Stealing property	Bribery
Observations	1,228	1,228	1,228	1,228	1,212
Exogeneity test p-value	0.013	0.021	0.661	0.322	0.489
Sargan test p-value	0.636	0.615	0.488	0.270	0.537
F-statistic first stage			18.310		18.625

Both basic and advanced financial literacy positively and significantly affect financial satisfaction; the F-statistics are above the value recommended to avoid the weak instruments problem (Staiger and Stock, 1997). For all our dependent variables, Sargan test indicates no rejection of instruments' validity. When we consider cheating towards the government (*benefits fraud* and *tax evasion*), we find evidence of the endogeneity of financial satisfaction. Conversely, the exogeneity test is not rejected when we move to the other forms of cheating (*fare evasion*, *stealing property* and *bribery*).

Appendix D. Robustness checks

Table D.1. IV estimates using binary instruments

	(1) Benefits fraud IV	(2) Tax evasion IV	(3) Fare evasion IV	(4) Stealing property IV	(5) Bribery IV
Financial satisfaction	-0.111***	0.101**	-0.021	-0.018	-0.007
	(0.038)	(0.047)	(0.043)	(0.027)	(0.034)
Love of money	0.041	0.093**	0.058*	0.044*	0.053*
	(0.028)	(0.036)	(0.034)	(0.023)	(0.029)
General trust	-0.059***	-0.076***	-0.096***	-0.048***	-0.038*
	(0.021)	(0.029)	(0.027)	(0.016)	(0.021)
Control variables	Yes	Yes	Yes	Yes	Yes
Observations	1,228	1,228	1,228	1,228	1,212
F-statistic	15.759	15.759	15.759	15.759	16.437
Sargan test p-value	0.942	0.710	0.441	0.533	0.897
Exogeneity test p-value	0.005	0.035	0.587	0.591	0.892

Notes: Control variables are the same as reported in Tables 2 and 3. Heteroskedasticity-consistent standard errors are in parentheses. ***, **, * denote significance at the 1 percent, 5 percent, and 10 percent levels.

Table D.2. IV estimates using only basic financial knowledge as instrument for financial satisfaction

	(1) Benefits fraud IV	(2) Tax evasion IV	(3) Fare evasion IV	(4) Stealing property IV	(5) Bribery IV
Financial satisfaction	-0.077*	0.109**	0.006	-0.049	-0.048
	(0.041)	(0.051)	(0.049)	(0.035)	(0.043)
Love of money	0.039	0.092**	0.057*	0.045*	0.055*
	(0.027)	(0.036)	(0.034)	(0.024)	(0.030)
General trust	-0.056***	-0.075**	-0.093***	-0.052***	-0.042*
	(0.020)	(0.030)	(0.027)	(0.017)	(0.022)
Control variables	Yes	Yes	Yes	Yes	Yes
Observations	1,228	1,228	1,228	1,228	1,212
F-statistic	19.828	19.828	19.828	19.828	20.084
Exogeneity test p-value	0.109	0.030	0.920	0.175	0.375

Notes: Control variables are the same as reported in Tables 2 and 3. Heteroskedasticity-consistent standard errors are in parentheses. ***, **, * denote significance at the 1 percent, 5 percent, and 10 percent levels.

Table D.3. Regression results using Lewbel IV estimator

	(1) Benefits fraud IV	(2) Tax evasion IV	(3) Fare evasion IV	(4) Stealing property IV	(5) Bribery IV
Financial satisfaction	-0.031**	-0.005	0.007	-0.002	0.002
	(0.013)	(0.018)	(0.017)	(0.011)	(0.014)
Love of money	0.037	0.097***	0.057*	0.043**	0.053**
	(0.024)	(0.034)	(0.033)	(0.020)	(0.026)
General trust	-0.051***	-0.087***	-0.093***	-0.046***	-0.037*
	(0.019)	(0.028)	(0.027)	(0.017)	(0.022)
Control variables	Yes	Yes	Yes	Yes	Yes
Observations	1,228	1,228	1,228	1,228	1,212
Sargan test p-value	0.147	0.873	0.110	0.918	0.707
R-squared	0.030	0.044	0.091	0.043	0.058

Notes: Control variables are the same as reported in Tables 2 and 3. Instruments are generated using Lewbel's method. ***, **, * denote significance at the 1 percent, 5 percent, and 10 percent levels.

Table D.4. OLS estimates including household income as an additional explanatory variable

	(1) Benefits fraud OLS	(2) Tax evasion OLS	(3) Fare evasion OLS	(4) Stealing property OLS	(5) Bribery OLS
Financial satisfaction	-0.014**	0.010	0.003	-0.004	-0.011
	(0.006)	(0.008)	(0.008)	(0.004)	(0.007)
Love of money	0.040	0.099***	0.062*	0.044*	0.056*
	(0.026)	(0.035)	(0.034)	(0.024)	(0.030)
General trust	-0.051***	-0.088***	-0.096***	-0.047***	-0.040*
	(0.019)	(0.027)	(0.026)	(0.016)	(0.021)
(log)income	-0.026*	-0.005	-0.018	-0.001	-0.013
	(0.015)	(0.019)	(0.019)	(0.008)	(0.017)
Control variables	Yes	Yes	Yes	Yes	Yes
Observations	1,228	1,228	1,228	1,228	1,212
R-squared	0.040	0.049	0.094	0.044	0.063

Notes: When income is included in the specification we consider OLS rather than IV regression model as we cannot reject the null hypothesis of weak instruments. Control variables are the same as reported in Tables 2 and 3. Heteroskedasticity-consistent standard errors are in parentheses. ***, **, * denote significance at the 1 percent, 5 percent, and 10 percent levels.

Table D.5. Regression estimates by omitting general trust

	(1) Benefits fraud IV	(2) Tax evasion IV	(3) Fare evasion OLS	(4) Stealing property OLS	(5) Bribery OLS
Financial satisfaction	-0.088***	0.093**	0.002	-0.003	-0.012*
	(0.032)	(0.039)	(0.008)	(0.004)	(0.006)
Love of money	0.042	0.096***	0.061*	0.046*	0.055*
	(0.027)	(0.036)	(0.034)	(0.024)	(0.030)
Control variables	Yes	Yes	Yes	Yes	Yes
Observations	1,228	1,228	1,228	1,228	1,212
R-squared			0.082	0.037	0.059
F-statistic	18.194	18.194			
Sargan test p-value	0.559	0.543			
Exogeneity test p-value	0.012	0.024			

Notes: Control variables are the same as reported in Tables 2 and 3. Exogeneity test is rejected for "Benefits fraud" and "Tax evasion"; for these variables we report the corresponding IV estimates. Heteroskedasticity-consistent standard errors are in parentheses. ***, **, * denote significance at the 1 percent, 5 percent, and 10 percent levels.

Appendix E. Further extensions

E.1. Potential drivers of financial satisfaction

This appendix provides additional information on the potential drivers of financial satisfaction. We first look at the correlation between financial satisfaction and some other factors that can affect individuals' financial condition. Specifically, we consider a binary variable representing "*homeownership*" and four dummies representing assets held by respondents, such as checking accounts or savings certificates ("*safe*"), insurance policies ("*insurance*"), stocks, options or warrants ("*risky*") and "*real estate*". We also consider a variable representing respondents' satisfaction with their wages on a scale ranging from 0 to 10 ("*earnings*"). Table E.1.1 reports the correlation matrix of variables.

Table E.1.1. Correlation matrix

	Financial satisfaction	Home ownership	Safe	Insurance	Risky	Real estate	Earnings
Financial satisfaction	1.000						
Home ownership	0.162	1.000					
Safe	0.125	0.095	1.000				
Insurance	0.149	0.129	0.121	1.000			
Risky	0.149	0.182	0.116	0.303	1.000		
Real estate	0.041	0.106	0.035	0.068	0.140	1.000	
Earnings	0.379	0.018	-0.037	0.037	0.017	-0.065	1.000

It is observed from Table E.1.1 that none of the variables is highly correlated with financial satisfaction. The maximum correlation is between "*financial satisfaction*" and "*earnings*" and is equal to 0.379. However, the number of complete observations for the variable representing respondents' satisfaction with their wages is rather low (n=607). Thus, any conclusion based on the results reported in Table E.1.1 may be misleading.

Therefore, to shed more light on the drivers of financial satisfaction we proceed as follows: we first define a dummy variable equal to one if the respondent states to be more satisfied than the average with her wage (the average wage satisfaction in our sample is equal to 6.7). We interpret this variable as a measure of "*wage satisfaction*". Similarly, we create another variable equal to one if the individual is not satisfied with her wage. To test whether the effect of financial satisfaction on cheating depends on wage satisfaction we estimate the following equation:

$$c_i = \beta_0 + \beta_1 finsatisfaction * wage\ satisfaction_i$$
$$+ \beta_2 finsatisfaction * wage\ dissatisfaction_i + \beta_3 lovemoney_i$$
$$+ \beta_4 generaltrust_i + X_i' \beta_5 + F_i' \beta_6 + \varepsilon_i$$

(2)

where X_i' and F_i' include the same explanatory variables as indicated in equation (1). Regression results from this alternative model are reported in Table E.1.2.

Table E.1.2. Interaction between financial satisfaction and wage satisfaction

	(1) Benefits fraud OLS	(2) Tax evasion OLS	(3) Fare evasion OLS	(4) Stealing property OLS	(5) Bribery OLS
Financial sat*wage sat	-0.006	0.004	0.002	0.000	-0.001
	(0.004)	(0.006)	(0.006)	(0.004)	(0.005)
Financial sat*wage dissat	-0.003	0.013	0.010	0.005	0.006
	(0.006)	(0.008)	(0.009)	(0.005)	(0.007)
Love of money	0.035	0.095***	0.056*	0.042*	0.052*
	(0.026)	(0.035)	(0.034)	(0.023)	(0.030)
General trust	-0.049***	-0.087***	-0.094***	-0.047***	-0.038*
	(0.019)	(0.027)	(0.026)	(0.016)	(0.021)
Control variables	Yes	Yes	Yes	Yes	Yes
Test on the interaction coefficients	[0.456]	[0.191]	[0.281]	[0.240]	[0.167]
Observations	1,228	1,228	1,228	1,228	1,212
R-squared	0.032	0.048	0.093	0.044	0.061

Notes: Control variables are the same as reported in Tables 2 and 3. Heteroskedasticity-consistent standard errors are in parentheses. ***, **, * denote significance at the 1 percent, 5 percent, and 10 percent levels.

In the model we are most interested in the interaction terms. It is reasonable to believe that financial satisfaction may be driven by wage adequacy. However, we do not find evidence of a significant difference between respondents who are satisfied with their current status and their wages (β_1) and those who are satisfied with their status, but not with their wages (β_2). Test on the equality of the interaction coefficients reveals that the p-value associated to the Chi-squared test is above 0.10 in each specification. As discussed in Sub-section 2.3.2, results reported in Table E.1.2 confirm that financial satisfaction is more than a matter of economic setting. Personality traits, subjective expectations and aspirations about standard of living may be more important drivers of financial satisfaction.

E.2. Financial satisfaction and love of money

The effect of financial satisfaction on individuals' attitudes towards dishonesty may depend on the love of money. To test for that, we consider an alternative specification that includes an interaction between financial satisfaction and love of money. Results are reported in Table E.2.

Table E.2. Financial satisfaction, love of money and their interaction

	(1) Benefits fraud IV	(2) Tax evasion IV	(3) Fare evasion OLS	(4) Stealing property OLS	(5) Bribery OLS
Financial satisfaction	-0.096***	0.102**	-0.001	-0.004	-0.014*
	(0.037)	(0.045)	(0.008)	(0.005)	(0.007)
Love of money	-0.435*	0.566*	-0.020	0.038	-0.015
	(0.247)	(0.298)	(0.130)	(0.074)	(0.108)
General trust	-0.054***	-0.079***	-0.093***	-0.047***	-0.038*
	(0.020)	(0.029)	(0.026)	(0.016)	(0.021)
Financial sat*lovemoney	0.071*	-0.071	0.012	0.001	0.010
	(0.037)	(0.045)	(0.019)	(0.010)	(0.015)
Control variables	Yes	Yes	Yes	Yes	Yes
Observations	1,228	1,228	1,228	1,228	1,212
R-squared			0.092	0.043	0.062
F-statistic	16.077	16.077			
Sargan test p-value	0.616	0.631			
Exogeneity test p-value	0.013	0.018			

Notes: Control variables are the same as reported in Tables 2 and 3. Heteroskedasticity-consistent standard errors are in parentheses. ***, **, * denote significance at the 1 percent, 5 percent, and 10 percent levels.

We notice from Table E.2 that the degree of love of money is not too crucial for the impact of financial satisfaction on cheating. The interaction term is statistically significant only in Column 1, where we analyze the propensity of accepting incorrect behaviors related to government benefits. The positive effect of the interaction term partly counterbalances the negative effect of financial satisfaction; thus, the overall effect of financial satisfaction seems to be lower in absolute terms for those who value money highly. This cautiously indicates that individuals who love money may be less sensitive to social problems and more likely to justify all forms of cheating towards the government. Further research would be required to

draw rigorous conclusions: this is only a first step towards investigating more deeply the relationship between financial satisfaction, love of money and cheating.

E.3. Cross country comparison

Table E.3. Mean values per Country/Region on the willingness to accept fare evasion (panel "a") and tax evasion (panel "b")

	Total	Indonesia	Italy	Netherlands	Russia	Sweden	United States
Panel (a): Justifiable-avoiding a fare on public transport							
Never justifiable	55.9	78.6	62.9	65.1	35.5	45.6	47.3
2	9.9	9.5	9.2	10.1	7.0	15.0	11.4
3	6.8	2.8	7.0	6.9	7.2	12.1	8.4
4	4.1	1.3	6.2	5.3	6.6	6.9	4.8
5	8.2	2.3	7.0	5.1	12.8	7.9	14.1
6	3.6	1.3	3.2	3.2	5.5	3.8	4.5
7	2.6	0.8	1.3	1.8	5.4	4.0	1.7
8	1.6	0.3	1.0	0.7	3.8	2.7	0.8
9	0.8	0.7	0.4	0.3	1.9	0.5	0.2
Always justifiable	3.2	1.3	0.5	1.0	9.5	1.1	1.4
Missing	2.5	0.9	1.3	0.5	4.8	0.5	5.5
Mean	2.55	1.60	2.09	2.04	3.94	2.68	2.60
Number of obs.	8,156	1,994	999	1,044	1,941	998	1,180
Panel (b): Justifiable-cheating on taxes							
Never justifiable	60.7	77.8	60.9	60.2	47.9	53.1	60.4
2	10.4	9.9	10.1	10.7	6.9	17.7	10.8
3	6.8	2.9	10.1	7.0	6.7	11.3	7.3
4	4.1	1.9	4.5	4.7	5.9	4.7	3.5
5	6.0	1.3	5.3	6.6	10.5	5.1	7.2
6	2.6	1.1	3.5	2.9	3.7	2.1	2.5
7	1.8	1.1	1.6	2.5	3.0	1.6	0.7
8	1.3	0.4	1.4	1.3	2.2	2.1	0.7
9	0.9	0.8	0.4	0.5	1.8	0.8	0.1
Always justifiable	2.1	0.9	1.3	2.2	4.9	0.8	1.4
Missing	3.2	1.9	1.0	1.4	6.3	0.7	5.3
Mean	2.24	1.57	2.18	2.30	3.03	2.25	2.06
Number of obs.	8,092	1,972	1,002	1,035	1,901	996	1,182

Notes: Data are from World Values Survey Wave 5, 2005-2009.

Chapter 3

SAVING BEHAVIOR:

FINANCIAL SOCIALIZATION AND SELF-CONTROL

Abstract

This study examines the linkages between financial socialization and self-control in explaining saving behavior. Using novel household survey data from the United States, we decompose the effect of financial socialization in its direct and indirect components, mediated through self-control. In addition, we analyze the relationship between these two dimensions and the ownership of different financial products, as well as the decision to save through alternative saving strategies. Our results show that financial socialization received early in life is positively associated with general saving habits. Furthermore, we find that parents' financial socialization influences the development of children's self-control skills. However, their contribution differs depending on the type of financial product being analyzed.

1. Introduction

Many individuals do not save or save sub-optimally, reaching the retirement age with virtually no personal financial assets and limited resources to meet unforeseen expenses (Poterba *et al.*, 1996). This issue is of special relevance in the US, where Social Security benefits are low compared with other advanced countries. The change toward defined-contribution plans has shifted the responsibility of saving onto private individuals, who must be able to accumulate an adequate level of income for retirement (Thaler and Benartzi, 2004). According to the Northwestern Mutual's 2018 Planning and Progress Study, 78 percent of American people state they are worried about not having enough money to cover expenses at retirement age. In fact, 10 percent of the people declare they own less than 5,000 USD on retirement savings while another 21 percent indicate they have nothing.

Research on saving behavior attributes a key role to financial literacy in stimulating saving (Van Rooij *et al.*, 2012). As an extension, all forms of education toward financial and economic issues, taught at any age, can be seen as potential drivers of a more widespread saving behavior. One form of financial education is the so-called financial socialization, i.e., any form of financial education received when children or adolescents from several socialization agents, including parents, educators, peers and schools. Previous research indicates the effect of parenting to be as far stronger than financial socialization through any other socialization agent (Shim *et al.*, 2009; Grusec, 2011). Children acquire financial skills within the family through different socialization processes, such as observing parents' financial behavior or speaking with them about financial topics since young age (Solheim *et al.*, 2011). In this way, children develop financial skills and capabilities that foster their financial independence and facilitate their transition into adulthood.

It is nowadays widely acknowledged that relevant lifetime financial outcomes can be partially explained by differences in non-cognitive traits during childhood (Lades *et al.*, 2017). Economists are devoting increasing interest to the role of personal self-control as an effective predictor of saving behavior (Tangney *et al.*, 2004; Achtziger *et al.*, 2015). Self-control is typically defined as the ability to resist temptation and to overcome first impulses (Baumeister, 2002). Self-control problems might hinder savings via over spending (Thaler and Shefrin, 1981). As such, people *under*save because they lack the willpower to do so. Consequently, self-control problems typically result in overconsumption and low wealth (Ameriks *et al.*, 2007).

Research generally indicates that parenting is important to the process of developing self-control among young people (Feldman and Weinberger, 1994; Hay, 2001). Because of this, in this research we hypothesize that financial socialization affects saving behavior as well as personal self-control. Specifically, we expect a positive link between financial socialization and saving behavior,

since parents may help the development of good saving habits by encouraging children to use financial products while growing up at home. Moreover, we expect a positive relation between financial socialization and self-control, which is also supposed to be a significant driver of saving behavior. Thus, financial socialization might exert both direct and indirect effects on saving behavior through self-control.

The main contribution of this empirical work is twofold. First, since we hypothesize that self-control mediates the association between financial socialization and saving behavior, we decompose the effect of financial socialization on saving habits into direct and indirect components through self-control. We perform a mediation analysis by using the KHB method (Karlson et al., 2012), which extends the decomposition properties of linear models to nonlinear ones and has been shown to perform better, or at least as well as, other existing methods. In our research we extend previous work by Bucciol and Veronesi (2014), who document a positive direct effect of parental teachings received during childhood on the propensity to save during adulthood, and consider the role of self-control as a potential mediator. A second contribution of this paper is that we examine the different links between financial socialization, self-control and several financial products and services like checking accounts, educational loans, insurances, retirement accounts and financial assets. In addition, we explore the role of financial socialization and self-control on automated savings for both retirement and non-retirement purposes.

Therefore, this study explores how financial socialization and self-control are related with saving behavior while controlling for several sociodemographic characteristics. To this end, we use novel US household data collected in year 2016 from the National Financial Well-Being Survey. We measure financial socialization as exposure while growing up to financial concepts across different dimensions, including, among others, discussions about financial issues, teachings on how to be smart shoppers and experiential learning through allowances or saving accounts. Hence, our measure of financial socialization is broader than the ones used in previous literature, covering both the practical and theoretical knowledge about generic and specific economic concepts learned in young age.

Our findings indicate that parental influence is a significant driver of respondents' saving behavior. Financial socialization received at young age is found to be positively related with the subsequent probability to save regularly, both directly and indirectly via self-control. We show that individuals who received teachings about money in young age, then later in life are more likely to hold safe financial products such as insurances or retirement accounts. In addition, our results suggest that financial socialization increases individuals' awareness in the financial domain, fostering their competence in holding financial assets during adulthood. When we explore the

specific effect of self-control in determining saving behavior, we find that an increase in self-control rises the propensity to have money in retirement accounts and financial assets. Moreover, both financial socialization and self-control exert positive and significant effects on the decision of automatically transferring savings to both retirement and non-retirement accounts.

The pattern of under-saving has raised concern by academics and policy makers, who have started to devote special attention to the determinants of saving behavior. The identification of which characteristics correlate with saving behavior can be of great relevance to develop adequate policy interventions to stimulate savings. Our results underline the importance of parents as relevant socialization agents in the formation of financial values, norms and habits that drive financial well-being during adulthood (Drever *et al*., 2015). Since our measure of financial socialization does not only cover teachings but also 'active' education in the form of having to manage a regular allowance, we believe that the measure we use captures in a better way the spirit of financial socialization.

The remainder of this paper is organized as follows. Section 2 provides a review of the literature. Section 3 presents the data and some summary statistics. Section 4 discusses the empirical analysis for saving habits, presenting the benchmark results and some robustness checks. Section 5 reports results from the role of financial socialization and self-control on different financial products and services and on automated saving strategies. Finally, Section 6 concludes.

2. Literature review

This study examines the role of financial socialization and self-control on saving behavior. This section provides an overview of existing research on these three topics: saving behavior, self-control problems and financial socialization.

2.1. Saving behavior

Saving behavior patterns have been widely analyzed in the economic literature, especially in the US context, where household saving rates have declined dramatically over the last 20 years (Wisman, 2009). Previous research indicates that a large fraction of Americans, and in particular those belonging to the so-called *baby boom* generation, save too little (Bernheim *et al*., 2001). In line with this, Munnell *et al.* (2009) show that nearly half of workers in the US are expected to be unable to keep their standard of living in retirement. In December 2016, the average benefits for the principal groups of Social Security beneficiaries in the US, notably retired, disabled workers, and aged widows and widowers were lower compared with other major industrial countries (OECD,

2017). For this reason, we have observed a switch to defined-contribution plans, such as a 401(k), which shift financial risks and responsibilities to the employees. The transition towards defined contribution plans has potential implications for financial stability, as it provides households with much more choice and flexibility in terms of how to manage their savings and investments.

Saving behavior has been associated with several socio-demographic factors. Women typically save less and score lower than men on risk tolerance measures (Fisher *et al.*, 2015). Hence, it is possible that risk tolerance contributes to a gender difference in savings. Researchers have also found that saving increases with age (Chang, 1994). Moreover, saving behavior is also influenced by decisions taken from peers. For instance, Duflo and Saez (2003) show that social interactions are a powerful mechanism in the process of information acquisition, with strong effects on economic decisions.

Among the different drivers of wealth heterogeneity, financial literacy has been shown to positively affect wealth accumulation (Van Rooij *et al.*, 2012). Financial literacy can be defined as people's ability to process economic information and make informed financial decisions (Lusardi and Mitchell, 2014). It has been significantly and positively associated with stock market participation, retirement planning and wealth accumulation (Van Rooij *et al.*, 2011a; 2011b; 2012). Fairly robust evidence also shows that people with low levels of financial literacy are more likely to exhibit debt problems (Lusardi and Tufano, 2015).

Economic theory assumes that individuals have full information and process it properly, so that their financial choices are the result of maximizing a utility function (DellaVigna, 2009). However, the empirical evidence suggests deviations from this standard theory, as people do not always make sound financial decisions. Sometimes individuals do not adequately plan for retirement and many households report that they would like to save more but lack willpower (Lusardi and Mitchell, 2008).

Much of the recent literature seeks to incorporate behavioral factors into models of saving behavior. Madrian and Shea (2001) analyze the impact of automatic enrollment in the 401(k) plan on saving behavior of employees. Their findings do not only indicate an increase in 401(k) participation under automatic enrollment, but they also conform with several behavioral explanations for individual savings behavior, such as anchoring around the default and status quo bias. In line with this, Knoll (2010) shows that when deciding about how and when to save for retirement, individuals make suboptimal choices as they often rely on heuristics or rules of thumb.

In the past few years, automatic saving has been proved to be one of the most powerful remedies against low participation and savings contribution rates (Tantia *et al.*, 2014). All in all, these results highlight the importance of also considering behavioral factors in the determination of

saving behavior: bounded rationality, procrastination and nominal loss aversion may all play a role in explaining lack of saving (Thaler and Benartzi, 2004). In this sense, self-control is also indisputably an important factor for saving outcomes (Thaler, 1994).

2.2. Self-control problems

Economists are devoting increasing interest to the effects of dynamic inconsistencies, self-control and temptation on intertemporal decisions. Self-control is typically defined as the ability to resist temptation and to overcome first impulses (Baumeister, 2002). Previous literature on self-control strongly highlights its importance as a psychological resource that influences individuals' financial behavior (Achtziger *et al.*, 2015). High self-control has been positively related with goal achievement, the propensity to save regularly and, consequently, with the ability to manage unforeseen expenses (Tangney *et al.*, 2004). On the other hand, Gathergood (2012) shows that consumers who lack self-control make greater use of quick-access financial products and are more likely to have problems in dealing with over-indebtedness. Interestingly, using a sample of highly educated adults, Ameriks *et al.* (2007) explore the relation between self-control and wealth and find that self-control problems are smaller in scale for older than for younger respondents.

The effect of self-control on the decisions to save is difficult to predict a priori. Several studies agree to note that people fail to save for retirement even though they plan to do so (Choi *et al.*, 2002). Self-control failures are argued to be among the reasons why people exhibit time inconsistent preferences (Beshears *et al.*, 2015). Several scholars have been concerned about how self-control affects saving for retirement (Jabobs-Lawson and Hershey, 2005). However, the empirical findings are mixed. On the one hand, self-control problems might hinder savings via over spending (Thaler and Shefrin, 1981). Individuals who lack self-control usually prefer investment opportunities that provide higher immediate utility, as their spending attitudes are driven by short-term and impulsive motives (Gathergood and Weber, 2014). On the other hand, knowing their lack of self-control, they might look for commitment devices, such as pensions, in order to limit their future temptation (Laibson, 2015). This is a central implication from the models of dynamically inconsistent time preferences (Strotz, 1956).

2.3. Financial socialization

Previous work has found a positive association between financial literacy among the young and parents' financial sophistication (Lusardi *et al.*, 2010). Economic habits might be easily transmitted from parents to children through the mechanism of financial socialization. Hence, in this research we look at the role played by financial socialization in affecting saving behavior.

Money education received during young age positively affects subsequent financial decisions, notably those involving saving and assets accumulation. For instance, Bucciol and Veronesi (2014) find a positive effect of parental teaching strategies received during childhood on the propensity to save during adulthood. Similarly, using a Dutch sample of young adults, Webley and Nyhus (2013) provide evidence of a positive link between parental encouragement and the ability to control spending, saving preferences, conscientiousness and future orientation. In line with this, Bucciol and Zarri (2019) show that saving education provided by parents induces people to be more future oriented later in life. Kim and Chatterjee (2013) study the association between financial socialization experiences and beneficial financial practices in young adulthood. Their results indicate that owning a saving account during childhood is positively associated with financial asset ownership during adulthood. According to Serido and Deenanath (2016), children's progress toward financial independence is mainly driven by parental teachings. Therefore, parents play an important role in influencing good financial habits during childhood, which might also persist later in life.

Research on financial socialization supports a common view of parental education as a transitional process from childhood into early adulthood in which children develop consumer roles and gain financial independence (Gudmunson *et al.*, 2016). As stated by McGoldrick and Carter (1999), the successful transition throughout the life cycle stages is largely dependent on achievements and skills acquired in previous stages. Financial socialization goes further than simply focusing on an improvement in financial knowledge, as it represents the process by which attitudes and values of individuals are formed (Grohmann *et al.*, 2015).

However, the association between financial socialization and economic behavior might be mediated by third factors, being financial goals among the most widely studied (Topa and Herrador-Alcaide, 2016). For instance, Lee and Yu (2017) study the relationship between parenting behavior during adolescence and children's financial efficiency in early adulthood, finding adolescents' future orientation as a significant mediator between these two dimensions. Adolescents who learn from parents through financial socialization develop general skills that will be maintained over the life course. One of these skills is self-control. High self-control allows individuals to diligently follow their financial plans and to convert their financial goals into responsible financial behaviors (Tang, 2017). Parental influence is particularly important during adolescence, when the differences in self-control are established (Hay, 2001). Indeed, according to Gottfredson and Hirschi (1990), one of the major causes of low self-control is ineffective parenting. For instance, children whose parents do not monitor their children's behavior are expected to display low self-control and thus exhibit more deviant, delinquent, and criminal behaviors over the life-course.

Lades *et al.* (2017) investigate the impact of self-control problems in childhood on future pension participation. Their mediation analysis shows that a large part of this relationship (about 50 percent) can be explained by the contribution of self-control to a wide range of factors, such as educational attainment, economic status and home ownership. Furthermore, financial socialization from parents may also affect the behavior of children by influencing their general self-control skills, which in turn are important drivers of financial well-being during adulthood (Tang, 2017). To date, only a few studies have investigated the role of financial socialization in the development of self-control (Feldman and Weinberger, 1994; Hay, 2001), generally finding a positive effect.

3. Data

Our dataset comes from the US National Financial Well-Being Survey (from now on, NFWBS). This survey was conducted in year 2016 by the Consumer Financial Protection Bureau and it was fielded on the GfK Knowledge Panel.[1] Data have been collected between October 27 and December 5, 2016. Sample data were drawn from an online panel after being properly weighted to reflect the US adult population with respect to age, gender, ethnicity, poverty and educational levels.

The NFWBS primarily investigates financial knowledge, financial behavior and financial wellbeing of a representative sample of individuals. Variables collected through NFWBS include information about respondents' saving behavior, financial skills and attitudes, and other related factors. Socio-economic information such as age, ethnicity, labor status or household income of the respondents come from GfK Knowledge Panel data.[2] For our study purposes, the main advantage of this dataset is that it includes a battery of questions related to individuals' financial experience and behavior. This allows us to investigate several financial factors that might affect saving decisions, which have not been explored in the previous literature and, to the best of our knowledge, are not available in other datasets.

A total of 6,394 subjects completed the survey. In the questionnaire, respondents are asked who takes cares of the money matters at the household. They have to choose from the following options: i) "I take care of all or most money matters", ii) "Someone else and I take care of money matters about the same", iii) "Someone else takes care of all or most money matters". As in Van

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[1] The Consumer Financial Protection Bureau is a Federal agency created in year 2010 to regulate the use of financial products and to help consumers in understanding financial services, supporting their participation in financial markets. The GfK Knowledge Panel is the largest probability-based Internet panel in the US, with a total of about 55,000 panel members.

[2] These data were collected prior to the survey as part of GfK's standard business operations.

Rooij *et al.* (2012), we focus on respondents who state they are those who mostly make financial decisions at home, namely those who pay the bills and take the responsibility to make financial investments. Indeed, their financial capabilities are most relevant for household financial decision making (Smith *et al.*, 2010). Since the survey does not gather information on all the members in the household, this is done to drop from the sample those who have no decision power with regard to financial issues. This leaves a subsample of 3,235 individuals. After leaving aside some respondents with missing values in the variables of interest, our final sample consists of 2,854 observations.

3.1. Main variables

3.1.1. Outcome variables

Three different sets of outcome variables are considered to analyze the determinants of households' saving. First, we aim to empirically examine how financial socialization and self-control relate to general saving behavior. To this end, we define the dummy variable *saving habits*, which takes the value one if the respondent agrees with the following sentence: "Putting money into savings is a habit for me". Looking at this variable is useful to learn more on regular saving habits, which are extremely important to achieve financial goals and to have adequate emergency reserves (Fisher and Anong, 2012).

Second, as we have detailed data on financial products chosen by the individuals, we analyze the association between self-control, financial socialization and the decisions to save through specific financial products. Respondents are asked to select which financial products and services they currently have from an exhaustive list, ranging from checking or savings accounts to non-retirement investments, such as stocks, bonds or mutual funds. We group these items into five categories representing (1) checking accounts, (2) educational loans, (3) life or health insurance, (4) retirement accounts and (5) financial assets. We model each category as a dummy variable measuring whether individuals currently hold each of the different financial products or services. We refer the reader to Appendix A.1 for further details.

We finally explore how financial socialization and self-control are related with alternative saving strategies. The last decade has seen many behavioral applications to savings programs. In particular, automatic saving has been proved to be one of the most powerful remedies for low participation and savings contribution rates (Tantia *et al.*, 2014). Automatic saving may foster financial decisions, as it decreases the complexity of decision-making and it reduces attitudes of procrastination. However, the decision to save automatically has not been widely explored in previous research. NFWBS includes unique data to investigate this peculiar dimension of saving behavior. It contains two questions meant to assess whether respondents have money automatically

transferred into retirement and non-retirement saving accounts, respectively. These questions allow us to compare the features of such financial decisions with those of saving money voluntarily through different saving products. We define the dummy variable *automated retirement*, which is equal to one if the respondent allocates a certain amount of money into an account for retirement purposes, and zero otherwise. We create another dummy variable (*automated non retirement*) taking a value of one if the respondent chooses to transfer money automatically into a non-retirement account. The exact wording of the questions is reported in Appendix A.2.

3.1.2. Financial socialization and self-control

As discussed before, parents may transmit saving habits to children through the mechanism of financial socialization. There are different ways to introduce children to the value of money, such as setting regular allowances and saving goals or discussing with them questions about budgeting. We include a proxy for financial socialization in our analysis. Respondents were asked seven questions about teachings received from family while growing up at home, which are used by the NFWBS to measure *financial socialization*.

These questions ask respondents whether they discussed family matters with parents and if they spoke with them about the importance of saving. In addition to these standard items on financial socialization, individuals are asked information about specific parental lessons received in young age. Specifically, they are asked whether they received teachings about how to establish a good credit rating, how to be a smart shopper or how to determine success in life. The last two financial socialization items are related to practical teachings received from parents. Indeed, the NFWBS asks respondents if the family provided them with a regular allowance or a saving account. The exact wording of the questions is reported in Appendix A.3. For each item related to financial socialization, we define a dichotomous variable for respondents who provided a positive answer to each question. We perform a factor analysis with polychoric correlation on those binary variables. In this way, we are able to retain a unique index representing financial socialization. Bartlett test of sphericity (p-value< 0.001) indicates that it is appropriate to perform factor analysis.[3]

Next, we measure self-control based on the answers to three questions in the NFWBS. Individuals are asked to indicate on a scale from 1 ("Not at all") to 4 ("Completely well") the response that best describes them for each of the following items: "I often act without thinking through all the alternatives", "I am good at resisting temptation", "I am able to work diligently toward long-term goals". We model each item related to self-control as a dichotomous variable,

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[3] The summary index used in our analysis is mostly correlated with the second financial socialization item ("Spoke to me about the importance of saving"). The correlation is equal to 0.823.

with the value one representing answers 3 and 4 provided by respondents.[4] We then combine the information from the three items in a unique index representing individuals' self-control. Our summary index is drawn from a factor analysis with polychoric correlation; Bartlett test of sphericity (p-value< 0.001) indicates that it is appropriate to perform factor analysis. The index, that we label *self-control*, takes values in the 0-1 range and provides us with a comprehensive measure of individuals' self-control.

Given the relevance of behavioral biases in shaping economic behavior of individuals (Gathergood and Weber, 2014), we conduct a mediation analysis to investigate whether differences in self-control may act as a channel through which early financial socialization enhances individuals' saving decisions later in life. For instance, teachings received during childhood affect individuals' self-control (Tang, 2017), which in turn has been shown to influence financial behavior such as retirement planning, wise use of debt and credit, budgeting and saving (Baumeister, 2002; Howlett *et al.*, 2008).[5] After having identified the role of self-control as a mediator in the relation between financial socialization and saving behavior, we further investigate its role as an independent variable capable to affect saving behavior.

3.2. Summary statistics

Table 1 reports summary statistics of the variables used in the analysis. More than half of the respondents (55%) state that putting money into savings is a habit for them. The great majority of people (80%) own life or health insurances, 71% of respondents report to save through retirement accounts, while 34% hold financial assets; 20% of respondents currently have education saving accounts or loans and 87% have checking accounts. A similar percentage of individuals indicate to have money automatically transferred into retirement and non-retirement saving accounts (43% and 42%, respectively). In our sample, 54% declare to have received teachings about money during childhood and 80% show high levels of self-control.[6]

In our analysis we also control for standard socio-demographic characteristics. The average respondent is male, in the middle age group 35-54, married and without dependent children. About 42% of the respondents are graduated and only a small percentage of respondents (6.7%) are self-employed. Around half of the individuals report to be in good health and about 67% own their

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[4] We recode answers of the first statement such that, in all cases, an increase in the index implies higher self-control.

[5] Regression results reported in Appendix Table B.1 confirm that in our sample financial socialization during young age is a significant predictor of current self-control.

[6] Descriptive statistics about the original sample are very similar to those presented in Table 1. In particular, the mean levels of financial socialization and self-control in the original sample are equal to 54% and 78%, respectively.

home. Finally, 21% report levels of household income before taxes below 30,000 USD and 30% report levels of household income above 100,000 USD.

Table 1. Descriptive statistics

	Mean	**Std. dev.**	**Min.**	**Max.**
Outcome variables				
Saving habits	0.550	0.498	0	1
Life or health insurance	0.803	0.398	0	1
Retirement accounts	0.711	0.453	0	1
Financial assets	0.344	0.475	0	1
Educational loans	0.203	0.402	0	1
Checking accounts	0.876	0.329	0	1
Automated retirement	0.431	0.495	0	1
Automated non retirement	0.419	0.493	0	1
Main variables				
Financial socialization	0.545	0.328	0	1
Self-control	0.802	0.293	0	1
Control variables				
Age: 18-34	0.204	0.403	0	1
Age: 55-69	0.274	0.446	0	1
Age: > 69	0.194	0.396	0	1
Female	0.460	0.498	0	1
Married	0.557	0.497	0	1
No dependent children	0.641	0.480	0	1
College	0.422	0.494	0	1
Self-employed	0.067	0.250	0	1
Good health	0.501	0.500	0	1
Income <30k	0.212	0.409	0	1
Income >100k	0.301	0.459	0	1
Home owner	0.674	0.469	0	1
Area: Midwest	0.216	0.412	0	1
Area: South	0.357	0.479	0	1
Area: West	0.234	0.423	0	1

Notes: The final sample includes 2,854 individuals interviewed in year 2016. All the variables are dummy apart from self-control and financial socialization.

4. Empirical analysis: saving habits

We aim to examine the influence of financial socialization and self-control on individuals' saving habits. To this end, we estimate the following full latent linear model, for $i = 1,...,N$:

$$saving\ habits_i^* = \beta_0^F + \beta_1^F financial\ socialization_i + \beta_2^F selfcontrol_i + X_i'\gamma^F + \varepsilon_i^F \qquad (1)$$

where *saving habits** is a latent variable representing saving habits as previously described, *financial socialization* and *selfcontrol* are our variables of interest and β_1^F, β_2^F are the associated parameters to be estimated. The vector *X* includes standard socio-demographic information such as gender, age, education and marital status, plus economic and financial information on occupational status, housing property and income. Finally, ε^F is an idiosyncratic random error term. If we assume that ε^F follows a standard normal distribution, Equation (1) can be estimated using a Probit model, where the dependent variable *saving habits* is a dummy equal to one if the respondent has the habit to put money into savings.

As indicated before, we hypothesize that financial socialization exerts not only a direct effect on saving habits but also an indirect one through self-control. Here we are interested in disentangling how self-control partially mediates the total effect of financial socialization on saving habits.

In the context of linear regression, the total effect of financial socialization on saving habits could be estimated by running a reduced form of Equation (1) in which we leave out self-control as follows:

$$saving\ habits_i = \beta_0^R + \beta_1^R financial\ socialization_i + X_i'\gamma^R + \varepsilon_i^R \qquad (2)$$

being β_1^R a measure of the *total effect* of financial socialization on *saving habit*.

The *direct effect* of financial socialization on saving habits would be captured by the regression coefficient β_1^F in Equation (1). The *indirect effect* constitutes the part of the relationship between financial socialization and saving behavior that is due to self-control and it will be simply given by $\beta_1^R - \beta_1^F$. Hence, within the framework of linear regression models the decomposition of the total effect of a covariate into direct and indirect effects would be straightforward (Kohler *et al.*, 2011).

However, in non-linear regression models like Probit, identifying the indirect effect is not so easy as it depends on the scale parameters in Equations (1) and (2). More specifically, since coefficient estimates in a Probit model are equal to the true parameters divided by the scale of the random error term (Karlson *et al.*, 2012), the indirect effect of financial socialization on *saving habits* is given by:

$$\beta_1^R - \beta_1^F = \frac{\beta_1^R}{\sigma_2^R} - \frac{\beta_1^F}{\sigma_2^F} \qquad (3)$$

where σ_2^F and σ_2^R are the scale parameters in Equations (1) and (2) that are a function of the standard deviation of the error terms. Since adding variables to the model reduces the residual variance of *saving habits,* it holds that $\sigma_2^F \leq \sigma_2^R$. Thus, the indirect effect of financial socialization on saving habit through self-control cannot be simply addressed as $\beta_1^R - \beta_1^F$. As such, we would be conflating mediation with the rescaling of the model, a situation arising whenever the mediator variable has an independent effect on the dependent variable (Kohler *et al.*, 2011).

Therefore, to identify the pathways that explain why financial socialization affects saving habits we conduct a mediation analysis using the KHB procedure proposed by Kohler *et al.*, (2011) and by Karlson *et al.* (2012). Its main idea is to enrich the reduced latent linear model in Equation (2) with the inclusion in the specification of one further variable: the residuals from an OLS regression of *selfcontrol* on *financial socialization*. In this new model, the standard deviation of the residuals is identical to the one in Equation (1), which allows to have the same rescaling of the coefficients in Equation (3). Thus, we explore the relation between financial socialization, self-control and saving behavior by comparing different reparameterizations of the same model, both of which have not only the same scale parameter but also exactly the same error distribution. Based on Monte Carlo simulations, this procedure has been shown to be more effective than other alternatives such as average partial effects (Wooldridge, 2002) or the decomposition method proposed by Erikson *et al.* (2005) and Buis (2010) to split the total effect of a covariate in direct and indirect effects in the context of non-linear regression models. Mediation analysis through the KHB method has also been employed in the study about the effect of childhood self-control on adult pension participation by Lades *et al.* (2017). [7]

In our analysis we use the KHB method for decomposing the total effect of financial socialization on saving habits into its direct and indirect components through self-control. We report the outcomes of the regression analysis on saving habits and of the mediation analysis in Sub-section 4.1.

4.1. Regression results

We start our analysis by estimating the reduced form model of Equation (2). This way we look at the association between our measure of financial socialization and general saving habits,

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[7] In our analysis, the KHB method replaces self-control in Equation (1) by the residuals of an auxiliary regression of self-control on financial socialization. Since these residuals and self-control only differ in the share of self-control that is correlated with financial socialization, the scale of the error term in Equation (1) and the scale of the error term in the regression that uses the residuals are about the same, which in turn alleviates the rescaling issue. The difference between the β_1^R in (2) and the total effect obtained using the KHB method is due to a slight change in the scale of the coefficients when introducing the residuals. For further details about the method see Kohler *et al.* (2011).

while controlling for a wide set of control variables. The parameter estimates are shown in Column (1) of Table 2. Column (2) reports average marginal effects.

Table 2. Saving habits

	(1)	(2)	(3)	(4)
	Saving habits		**Saving habits**	
	Coefficient	**Marginal effect**	**Coefficient**	**Marginal effect**
Financial socialization	0.564***	0.200***	0.430***	0.144***
	(0.078)	(0.027)	(0.081)	(0.027)
Self-control			1.254***	0.419***
			(0.095)	(0.029)
Age: 18-34	0.012	0.004	0.011	0.004
	(0.073)	(0.026)	(0.075)	(0.025)
Age: 55-69	0.111*	0.039*	0.068	0.023
	(0.067)	(0.024)	(0.069)	(0.023)
Age: >69	0.059	0.021	-0.018	-0.006
	(0.077)	(0.027)	(0.079)	(0.026)
Female	-0.093*	-0.033*	-0.099*	-0.033*
	(0.051)	(0.018)	(0.052)	(0.018)
Married	0.014	0.005	-0.016	-0.005
	(0.055)	(0.020)	(0.057)	(0.019)
No dependent children	0.159***	0.056***	0.178***	0.060***
	(0.057)	(0.020)	(0.059)	(0.020)
College	0.161***	0.057***	0.135**	0.045**
	(0.056)	(0.020)	(0.057)	(0.019)
Self-employed	-0.294***	-0.104***	-0.317***	-0.106***
	(0.101)	(0.035)	(0.103)	(0.034)
Good health	0.303***	0.107***	0.199***	0.067***
	(0.051)	(0.018)	(0.053)	(0.017)
Income <30k	-0.211***	-0.075***	-0.196***	-0.066***
	(0.069)	(0.024)	(0.070)	(0.023)
Income >100k	0.311***	0.110***	0.310***	0.104***
	(0.062)	(0.022)	(0.063)	(0.021)
Home owner	0.315***	0.112***	0.248***	0.083***
	(0.060)	(0.021)	(0.062)	(0.021)
Area: Midwest	-0.043	-0.015	-0.078	-0.026
	(0.077)	(0.027)	(0.079)	(0.026)
Area: South	0.101	0.036	0.048	0.016
	(0.069)	(0.025)	(0.071)	(0.024)
Area: West	0.105	0.037	0.067	0.022
	(0.076)	(0.027)	(0.078)	(0.026)
Log-Likelihood	-1772.539		-1680.103	
Pseudo R-squared	0.097		0.145	
Avg. dependent variable	0.550		0.550	
Observations	2,854	2,854	2,854	2,854

Notes: Probit analysis, coefficients (Columns 1 and 3) and average marginal effects (Columns 2 and 4) reported. ***, **, * denote significance at the 1 percent, 5 percent, and 10 percent levels respectively. Reference groups are: age between 35 and 54 (age), less than college (education), other employments (occupational status), medium income (income), house renter (housing property), Northeast (area of residence).

It is clear that financial socialization is highly associated with general saving habits. In our sample, those who received teachings about money while growing up at home are 20 percent more likely to save on a regular basis, meaning that parental influence is a significant predictor of respondents' saving behavior. We find that early acquisition of financial skills has a significant role in stimulating good economic behavior such as better saving habits. Indeed, habits formed during youth are highly influential for adult behavior (Whitebread and Bingham, 2013).[8]

However, parents' financial socialization may also indirectly affect the behavior of children by influencing their general self-control skills. Indeed, through the process of financial socialization children develop self-control, which is another important driver of financial well-being in adulthood (Tang, 2017).

For this reason, we adopt the KHB method to test the mediating effect of self-control in the relation between financial socialization and saving habits. Table 3 shows the Probit regression coefficients obtained from the KHB method. The standard output of the method presents the direct, indirect and total effects. Our results suggest that financial socialization received during childhood has significant direct and indirect effects on respondents' saving habits. Indeed, having been provided with teachings about money while growing up at home leads to higher probability of developing saving habits, both directly (direct effect coefficient, $p<0.01$) and indirectly via self-control (indirect effect coefficient, $p<0.01$). It turns out that 28 percent (0.167/0.597) of the total effect of financial socialization is attributable to self-control.[9] This means that much of the pathway between financial socialization and saving behavior is via this variable: self-control is a channel through which financial socialization leads to better saving habits.

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[8] One might argue that the socio-economic background of the family relates with financial socialization in a way that affects saving behavior. In other words, children who grow up in richer families might receive higher financial education than comparable children who come from disadvantaged families. For this to be true, it must be the case that the index of financial socialization exhibits a certain degree of association with some dimension of parental socio-economic background. The NFWBS contains information on the highest level of education of the person who raised the respondent. We consider this variable as an indicator of socio-economic background. However, the correlation between financial socialization and parental education is quite low in our sample (0.256), meaning that the relationship between financial socialization and saving behavior is not explained by parental characteristics.

[9] The slight discrepancy between the coefficient of financial socialization reported in Table 2 (Column 1) and the one reporting the total effect of financial socialization in Table 3 is due to non-linearity. Results do not change qualitatively when we perform the mediation analysis by considering a linear model (OLS). The percentage of mediation in the linear case is equal to 27%.

Table 3. Mediation analysis

Saving habits	Coefficient	Robust Std. Err.	z	P>|z|	[95% Conf. Interval]	
Financial socialization						
(Total) Reduced	0.597	0.081	7.41	0.000	0.440	0.755
(Direct) Full	0.430	0.081	5.32	0.000	0.272	0.588
(Indirect) Diff	0.167	0.024	6.92	0.000	0.120	0.215

Notes: Total, direct and indirect effects of financial socialization on saving habits. The mediator in the indirect effect is self-control.

Subsequently, we add our measure of self-control as an independent regressor in our specification. We exploit the richness of our data to learn more on the role of self-control in determining saving habits. That is, we estimate the model in Equation (1). Columns (3) and (4) of Table 2 report the coefficients and the average marginal effects of the model which also includes self-control as a regressor, respectively.[10] The amount of explained saving habits variance substantially increases when we include self-control in the model. The significance patterns that emerge from the output provide interesting results.

We find that financial socialization is still positively and significantly related with the likelihood of saving regularly, even if the association between the two variables is quite lower after controlling for self-control. Results indicate that self-control is a significant predictor of saving habits.[11] In particular, one standard deviation increase of self-control raises the probability to save money as a habit by 0.293*0.419=12.2 percentage points. The positive effect of self-control on saving habits is strongly significant not only from a statistical perspective, but also from an economic point of view. Indeed, self-control increases the ability to delay gratification, which is critical to set financial goals and to develop household budgets in service of those goals (Drever *et al.*, 2015).

As regards the other control variables, we do not find a significant relationship between age and saving habits.[12] Conversely, we find a positive association between education and the

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[10] Table 2 also reports the coefficient estimates to be consistent with the decomposition made by the KHB method in Table 3. Note that the direct effect of financial socialization on saving habits obtained in Table 3 equals the parameter estimate of financial socialization in Column 2 of Table 2. It is important to highlight that the total effect reported in Table 3 is slightly different from the parameter estimate of financial socialization in Column 1 of Table 2 because the KHB procedure expresses the total effect in the same scale as the direct effect. This also happens in Lades *et al.* (2017).

[11] We repeat our estimates using a linear probability model with heteroskedasticity-consistent standard errors, obtaining similar results both quantitatively and qualitatively.

[12] We refer the reader to Appendix C to shed more light on the socio-demographic determinants of saving habits. In Appendix C.1 and C.2 we explore heterogeneity in the main findings across generations and by gender, respectively.

propensity to save regularly. People with higher educational levels may also increase their confidence in dealing with financial matters, with positive effects on their saving behavior. As expected, having no children that need to be financially supported increases the probability to save as a habit by 6 percent.

We also find that saving habits are 10.6 percent less likely for those who are self-employed. A possible interpretation is that other categories of workers, notably those who are employees, may foster their saving habits by participating in saving plans that have been already established in the workplace. Besides that, self-employed could be less stimulated to save regularly as they do not earn a constant wage.

The propensity for better saving habits is positively correlated with good health conditions. In addition, we show that an increase in income boosts the probability to save regularly. This result is in line with Chakrabarty *et al.* (2008), who find that households are more likely to follow a regular saving plan when they have higher permanent income. Finally, we find that individuals who own their house are more likely to save regularly compared to those who rent their house, possibly because of the lower financial constraints that they face. However, differences in saving habits may partly result from different preferences on consumption choices, including the choice about renting or buying a home. According to Henderson and Ioannides (1983), when the individual's investment demand is at least as great as his consumption demand, owning is preferred to renting. Individual preferences for investment rather than immediate consumption may also affect economic behavior by augmenting saving awareness, with positive impact on saving habits.

4.2. Robustness checks

In the previous analysis, we have presented regression results by using a summary index for self-control, which has been drawn from factor analysis. As a robustness check, we replace it with an alternative measure of self-control, which is a binary variable representing the likelihood of resisting temptation.[13] The main findings of Table 2 are confirmed, with financial socialization and self-control still positively and significantly related to the likelihood of saving regularly. Results from the mediation analysis are also consistent with those previously reported.

Another robustness check is related to the definition of financial socialization. As discussed in Sub-section 3.1.2, our key variable of interest is constructed as an index summarizing all the financial socialization items contained in the NFWBS data set. However, studies concerned about parental influence on economic behavior usually consider teachings on saving money only, rather

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[13] This is one of the three items that we used to build the summary index from factor analysis. We consider it as it provides the most relevant contribution in the definition of the summary self-control index.

than several other parental socialization practices (Bernheim *et al.*, 2001). Therefore, one may argue that our measure of financial socialization is too broad, as it could reflect a general competence in financial matters, rather than the specific effect of financial socialization. For this reason, we perform again our estimates in Table 2 by replacing the original financial socialization measure by two narrower indices that represent parental teachings about money (NFWBS financial socialization items 1-5) and financial hands-on experiences (items 6-7), respectively.[14] We refer the reader again to Appendix A.3 for further details. In addition, we also define financial socialization in a (standardized) 0-7 scale as the sum of the seven binary dummies for each of the above mentioned financial socialization items. Our central findings are not affected by these alternative definitions of financial socialization. Hence, the effects of financial socialization and self-control are consistent in sign and significance with those previously reported.[15]

Our findings of Tables 2 and 3 remain robust even when we restrict our sample to respondents younger than 50 years. We perform this additional check as someone might argue that the time between the respondent received financial socialization and the time she completes the survey would otherwise be too large. Even in this case the main coefficients do not change much, though precision of the estimates slightly declines.

Appendix D reports the regression output of the robustness checks mentioned above. We refer to Table D.1 for more details. We further test for the validity of our findings by repeating the analysis on saving habits using two alternative dependent variables related to saving behavior. We consider a variable representing the amount of money currently saved by respondents (in cash, checking and saving account balances) and a binary variable measuring respondents' propensity to plan by consulting their financial budgets. Regression output and mediation analysis for these alternative saving measures are reported in Appendix Table D.2 and are consistent with the main findings.

5. Extensions

5.1. Financial products and services

In this Section we further analyze the relationship between self-control, financial socialization and the decisions to save using different financial products and services. We estimate the following equation, for $i = 1, \dots, N$ and $j = 1, \dots, 5$:

$$Y_{i,j} = \beta_{0,j}^F + \beta_{1,j}^F \, financial\; socialization_i + \beta_{2,j}^F \, self control_i + X_{i,j}' \gamma_j^F + \varepsilon_{i,j}^F \qquad (4)$$

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[14] We first include them separately and then together in our specification.

[15] The estimation results from the mediation analysis are also qualitatively the same. Results are available upon request.

where now the dependent variable $Y_{i,j}$ is a vector of five binary outcomes for individual i denoting the categories of financial instruments (checking accounts, educational loans, life or health insurance, retirement accounts, financial assets) described in Sub-section 3.1.1. Exploring all these financial instruments is interesting not only because they have various financial purposes, but also because they differ in their frequency in the society.

Our goal here is to explore the relationship between financial socialization, self-control and the decisions to save through different financial products and services in a multivariate framework. Households frequently hold multiple financial products at the same time. Therefore, it is possible that the decisions to save through different financial products are jointly determined, rather than the result of independent processes. If there are meaningful correlations between the error processes, the simultaneous estimation of several binary outcomes will be more efficient than those derived from single-equation Probit regressions. Accordingly, we estimate a seemingly unrelated Multivariate Probit model by Maximum Likelihood.[16] Estimated average marginal effects are reported in Table 4. The correlation coefficients between the residuals from the Multivariate Probit equations are also presented in Table 4.

Most of the correlation coefficients of the residuals are statistically significant. This supports our hypothesis that the outcome variables share some common unobserved factors and justifies the use of Multivariate Probit instead of independent Probit model; the positive sign of the correlation coefficients indicates that the decisions to save through specific financial products or services are complimentary to each other. This suggests that respondents spread their investment portfolio among different financial instruments, which is a commonly used diversification strategy. For example, respondents who hold insurances tend to also have other financial products, notably retirement or checking accounts. Those who hold retirement accounts are also more likely to have financial assets. Conversely, no significant correlation is found between having financial assets and educational loans, meaning that the decisions to own these financial products are independent.

Our findings from Table 4 shed light on the importance of financial socialization and self-control and their relationships with many financial decisions. The exceptions are checking accounts, that are widespread in the population (87.6 percent of the individuals in the sample hold at least one account) and education loans, that instead are more rare (present in 20.3 percent of the sample) and related to a specific purpose. In particular, regression results reported in Columns 3-5 show that

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[16] The estimates have been conducted using the *cmp* module in Stata 15. The *cmp* modelling framework proposed by Roodman (2011) allows for the simultaneous estimation of several binary outcomes in which the errors share a multivariate normal distribution. It fits non-linear seemingly unrelated regression models based on Maximum Likelihood simulations. Moreover, it easily enables to retrieve marginal effects after estimation. For this reason, it is appropriate for jointly predicting decisions over different financial products on an individual-specific basis.

parental teachings have long-term impacts on how individuals behave in the future and confirm the role of parents as relevant socialization agents. Those who received financial socialization while growing up at home, through teachings about money or primary exposures to financial instruments, then later in life are more likely to have safe financial products such as insurances or retirement accounts (Columns 3 and 4). Our results on these dependent variables are in line with previous evidence by Bucciol and Zarri (2019), who show that socialization by parents enhances individuals' future orientation. Hence, we argue that future orientation is an important driver of financial decisions, with positive implications on the propensity to hold precautionary savings.

Financial socialization also increases the likelihood of having financial products such as stocks, bonds or mutual funds (Column 5). Indeed, financial socialization received early in life influences individuals' awareness in the financial domain, fostering their competence in taking financial decisions during adulthood. This confirms previous results by Shim *et al.* (2009), who show that individuals who are confident with their financial transactions tend to have sufficient guidance from their parents since childhood, in addition to basic financial knowledge acquired from different sources.

Our results indicate that an increase in self-control boosts the propensity to have money in retirement accounts by 9 percent, possibly because respondents with good self-control exhibit a higher preference for saving rather than spending left-over-money. They may find it less costly to reduce their current consumption in order to stick to their long-term financial plans.

Apart from being positively associated with the willingness to have retirement accounts, self-control positively affects the probability of having financial assets. Overall, results reported in Table 4 confirm previous research showing that individuals with high levels of self-control have better general financial behavior (Strömbäck *et al*., 2017). Nevertheless, it seems that financial socialization is more important than self-control for explaining financial assets ownership. We point out that in these specifications the coefficient estimates of financial socialization measure the direct effect, whereas the corresponding ones for self-control gather its effect plus the indirect effect of financial socialization. Since the marginal effect for the net impact of financial socialization is larger than the one for self-control, we have some evidence that financial knowledge matters more than self-control problems for holding financial assets. However, in the case of retirement savings, the size of both effects is roughly similar. Our findings presented in Table 4 also indicate interesting correlations among financial products and services and several socio-demographic factors, which we discuss hereafter.

Checking accounts

Having a checking account is a first step towards building a financial identity, which leads to further access to financial products and services (Hogarth *et al*., 2004). Checking accounts mainly exist to allow consumers instant access to cash and withdraw money, to pay bills, and for other everyday basic consumer financial needs. Indeed, holding checking accounts is widespread in our sample and it requires no specific financial skill or effort to exercise self-control. Even so, we find that some control variables are significantly related with the likelihood of having checking accounts. For instance, individuals who have higher education, rich income levels and those who own their home are more likely to have checking accounts. Such characteristics may help them to feel more comfortable with the banking system. Conversely, we find that the self-employed are less likely to hold checking accounts, possibly because of their stronger preferences for the privacy of their financial records (Hogarth *et al*., 2004).

Educational loans

Educational loans have become an important source of financial support for US households after the growing increase in higher education tuition prices (Fan and Chatterjee, 2018). Our results indicate that individuals older than 55 have 12 percent lower probability of asking for educational loans. Our reference group consists of working-age individuals, who may be more likely to take out educational loans in the wake of the last recession, possibly to boost their own employment prospects. Individuals may also take out loans to help finance for their children's college tuition rather than to fund their own education. We find that married individuals have a larger probability of holding loans compared to non-married individuals. Notice that, among the financial products and services considered in Table 4, being married is statistically significant only for this outcome variable. Married individuals are usually more constrained by their social networks, so that they may be more interested in achieving a wide range of educational opportunities (for themselves or for their children) which can ultimately influence their wealth and labor market participation. We find that low-income households are less likely to borrow for education. Educational loans must be repaid to avoid harsh penalties; for this reason, low-income households may wish to limit debt for fear of not succeeding in repaying it (Cowan, 2016).

Life or health insurance

We find that women are more likely to have insurances, probably because they are more risk averse than men and, consequently, make safer choices (Luciano *et al*., 2016). Interestingly, insurances ownership is positively related with college education. More educated individuals may have a stronger desire to protect family members, that is, a higher intensity of the bequest motive

(Truett and Truett, 1990). Other variables that explain the ownership of insurances are occupational status and income, which means that socioeconomic factors are important determinants of policy insurance holdings. Furthermore, decisions about insurances are strongly and positively correlated with home ownership. Indeed, many home mortgages include or require some life insurance (Gandolfi and Miners, 1996), all of which could explain the positive effect of home ownership on the dependent variable presented in Column 3. As for geographical differences, our results show that people in the South exhibit a lower likelihood of having life or health insurances in comparison to those living in the Northeast.

Retirement accounts

Demographics are also strongly associated with the probability of having retirement accounts. Older individuals, with high education and income and homeowners are more likely to have retirement accounts. Conversely, females are less likely to have such financial products. Household responsibilities among women may negatively affect their labor market participation, lowering their possibilities to obtain work-provided benefits such as employer-sponsored retirement plans.

Financial assets

Several variables, including age, gender, education and health status of respondents are significant determinants of financial assets ownership. Assets holding increases with age and income, while females are 5.9 percent less likely to have stocks, bonds or mutual funds. As expected, college educated are more likely to own these financial products. Indeed, holding income constant, higher education implies steeper income profiles than would be indicated by the income variable alone (Gandolfi and Miners, 1996). The absence of dependent children and the dummy variable for good health also show positive relationships with financial assets ownership. Interestingly, we find that people living in the Midwest have a higher probability of holding financial assets.

Table 4. Financial products and services

	(1) Checking accounts	(2) Educational loans	(3) Insurance	(4) Retirement accounts	(5) Financial assets
Financial socialization	0.015	-0.011	0.055**	0.087***	0.123***
	(0.018)	(0.022)	(0.022)	(0.021)	(0.025)
Self-control	0.021	-0.017	0.013	0.090***	0.076**
	(0.020)	(0.025)	(0.024)	(0.023)	(0.030)
Age: 18-34	0.005	0.108***	-0.010	-0.051***	-0.024

	(0.017)	(0.017)	(0.020)	(0.019)	(0.024)
Age: 55-69	0.019	-0.120***	0.015	0.090***	0.079***
	(0.016)	(0.019)	(0.019)	(0.019)	(0.021)
Age: >69	0.005	-0.126***	0.037*	0.088***	0.157***
	(0.018)	(0.024)	(0.022)	(0.022)	(0.023)
Female	-0.001	0.019	0.040***	-0.034**	-0.059***
	(0.012)	(0.014)	(0.014)	(0.014)	(0.016)
Married	0.019	0.047***	0.023	0.002	-0.028
	(0.013)	(0.016)	(0.015)	(0.015)	(0.018)
No dependent children	0.018	-0.115***	-0.004	0.043***	0.066***
	(0.013)	(0.015)	(0.016)	(0.016)	(0.018)
College	0.060***	0.145***	0.073***	0.133***	0.146***
	(0.014)	(0.015)	(0.016)	(0.016)	(0.016)
Self-employed	-0.056***	-0.003	-0.091***	-0.182***	0.003
	(0.021)	(0.026)	(0.026)	(0.026)	(0.031)
Good health	0.010	0.022	0.020	0.025*	0.050***
	(0.012)	(0.014)	(0.015)	(0.015)	(0.016)
Income <30k	-0.088***	-0.075***	-0.138***	-0.200***	-0.136***
	(0.014)	(0.021)	(0.017)	(0.016)	(0.025)
Income >100k	0.033**	0.037**	0.049***	0.103***	0.130***
	(0.017)	(0.016)	(0.019)	(0.019)	(0.018)
Home owner	0.055***	-0.064***	0.092***	0.147***	0.170***
	(0.014)	(0.017)	(0.016)	(0.015)	(0.020)
Area: Midwest	0.023	0.011	-0.013	0.017	0.064***
	(0.018)	(0.021)	(0.022)	(0.022)	(0.024)
Area: South	0.008	0.001	-0.040**	-0.033*	0.034
	(0.016)	(0.019)	(0.020)	(0.019)	(0.022)
Area: West	0.020	-0.034	-0.041*	-0.015	0.028
	(0.018)	(0.021)	(0.021)	(0.021)	(0.024)
$\rho12$	0.221***				
$\rho13$	0.400***				
$\rho14$	0.218***				
$\rho15$	0.210***				
$\rho23$	0.276***				
$\rho24$	0.118***				
$\rho25$	0.036				
$\rho34$	0.406***				
$\rho35$	0.207***				
$\rho45$	0.368***				
Log-Likelihood			-5825.552		
Pseudo R-squared			0.155		
Avg. dependent variable	0.876	0.203	0.803	0.711	0.344
Observations	2,854	2,854	2,854	2,854	2,854

Notes: Multivariate Probit analysis, average marginal effects reported. ***, **, * denote significance at the 1 percent, 5 percent, and 10 percent levels respectively**.** Reference groups are: age between 35 and 54 (age), less than college (education), other employments (occupational status), medium income (income), house renter (housing property), Northeast (area of residence).

5.2. *Saving strategies*

Finally, we investigate the association between financial socialization, self-control and the decision to save through different saving strategies. To this end, we consider the same specification described in Equation (1), where now the dependent variable *saving habits* is replaced by the

outcome variables on saving strategies presented in Sub-section 3.1.1 (*automated retirement* and *automated non retirement*). One could proceed modelling both outcomes separately. However, it is possible that decisions to save through different saving strategies may be jointly determined. Therefore, we use a seemingly unrelated bivariate Probit model (SUR-Biprobit), which allows for the simultaneous estimation of the correlation structure between the dependent variables and the regression coefficients. The relatedness between the two outcomes occurs via correlation of the errors that appears in the index-function model formulation of the binary outcome model. Specifically, the two outcomes are determined by a system of two equations:

$$\begin{cases} Automated\ retirement_i = \beta_0 + \beta_1 financial\ soc_i + \beta_2 self control_i + X_i'\gamma + \varepsilon_i \\ Automated\ non\ retirement_i = \beta_0 + \beta_1 financial\ soc_i + \beta_2 self control_i + X_i'\gamma + \omega_i \end{cases} \quad (5)$$

where the errors ε_i and ω_i are jointly normally distributed with mean zero, variance one, and correlations ρ. The model is jointly estimated by Full Information Maximum Likelihood. It collapses to two separate Probit models if $\rho = 0$.

Table 5 reports the results from the model on the decisions to save through an automated retirement account (Column 1) and an automated non-retirement account (Column 2). A problem of reverse causality could arise in the model specified in Equation (5), because the decision to save automatically may act as a commitment device that lowers perceived self-control problems. This notwithstanding, we are not claiming that our results should be given a causal interpretation. Even so, the correlation patterns between automated types of savings and the explanatory variables remain of great interest.

Results reported in Table 5 suggest that both financial socialization and self-control are positively and significantly associated with the decision to automatically transfer savings to both retirement and non-retirement accounts. Interestingly, the magnitude of the two effects is about the same. As argued before, we recall that the coefficient for financial socialization just measures the direct effect whereas the one for self-control also includes the indirect effect of financial socialization. Hence, from the marginal effects we cannot conclude which of the two dimensions weighs more.

Common strategies for self-control management rely on the use of automatic transfers from checking accounts to saving accounts (Webley and Nyhus, 2006). This would imply that people with high self-control would have a low demand for automated accounts. We find the opposite, which suggests that in our sample those who exhibit high self-control are more likely to invest in any types of financial instruments, choosing also committed devices. In turn, this may indicate that

the role of self-control in predicting financial decisions is mainly via the development of conscientiousness and future orientation among individuals. We are cautious when interpreting this result since our measure of this dimension is not specifically defined in the finance domain. Even though NFWBS measures the financial well-being of the US population, so that our self-control measure can be regarded as a valuable proxy for self-control problems, it might be the case that its estimated effect is confounded with other factors. Regarding the socio-demographic variables, an interesting result is that people in middle and elder age display a lower likelihood of having automated savings, either for retirement or for other purposes. Accordingly, automated savings appear to be more common among individuals under 55. A possible explanation is the following: if we consider automated savings to be a way of commitment for leaving some money aside for the future, people over 55 might be more concerned about the present due to having fewer years of life ahead. This does not mean they do not save money, but that at least they do not do it automatically.

Whilst males are more likely to hold automated non-retirement accounts, married people are less likely to have automated savings for retirement. Interestingly, self-employed people are less likely to hold automated savings, either for retirement or for non-retirement purposes. Conversely, both kinds of automated savings are more widespread among highly educated people. People in good health conditions display a higher probability of transferring money automatically to retirement accounts. As could be expected, the probability of saving automatically is higher among high income people and home owners. Everything else being equal, these individuals have higher chances for saving and thus a higher likelihood of transferring savings in an automated way.

Table 5 also presents the estimated tetrachoric correlation (ρ) between the error terms, which is significantly different from zero. This suggests that those who automatically save for retirement also transfer some automated savings for other purposes. Thus, the decisions to save through different saving products share some common unobservables that, in case of not accounting for, would lead to biased parameter estimates.

Table 5. Saving strategies

	(1) Automated retirement account	(2) Automated non retirement account
Financial socialization	0.095***	0.106***
	(0.026)	(0.028)
Self-control	0.139***	0.140***
	(0.030)	(0.032)
Age: 18-34	-0.031	-0.004
	(0.023)	(0.026)
Age: 55-69	-0.155***	-0.043*
	(0.021)	(0.024)
Age: >69	-0.335***	-0.078***

	(0.025)		(0.028)
Female	-0.015		-0.037**
	(0.017)		(0.018)
Married	-0.036**		-0.002
	(0.018)		(0.020)
No dependent children	-0.013		0.016
	(0.018)		(0.020)
College	0.096***		0.044**
	(0.018)		(0.020)
Self-employed	-0.220***		-0.065*
	(0.035)		(0.037)
Good health	0.045***		0.014
	(0.017)		(0.019)
Income <30k	-0.239***		-0.172***
	(0.024)		(0.026)
Income >100k	0.112***		0.078***
	(0.019)		(0.022)
Home owner	0.077***		0.062***
	(0.021)		(0.022)
Area: Midwest	0.024		-0.000
	(0.025)		(0.027)
Area: South	0.010		0.018
	(0.022)		(0.025)
Area: West	0.008		0.055**
	(0.024)		(0.027)
Rho (ρ)		0.455***	
Log-Likelihood		-3258.776	
Pseudo R-squared		0.119	
Avg. dependent variable	0.431		0.419
Observations	2,854		2,854

Notes: Bivariate Probit analysis, average marginal effects reported. ***, **, * denote significance at the 1 percent, 5 percent, and 10 percent levels respectively. Reference groups are: age between 35 and 54 (age), less than college (education), other employments (occupational status), medium income (income), house renter (housing property), Northeast (area of residence).

6. Conclusions

This paper contributes to the growing empirical literature on the determinants of saving behavior by exploring the role of financial socialization and self-control on saving decisions. Using novel data from the US, we have firstly assessed the direct and indirect linkages between financial socialization and saving habits using the KHB decomposition method. Consistently with our expectations, our results show that financial socialization does not only have a direct positive effect on the probability of saving money as a regular habit, but also an indirect positive one by means of increasing self-control. Hence, there are two different channels by which higher financial socialization is linked with a higher likelihood of developing saving as a habit. These findings clearly suggest that financial socialization received in young age has significant direct and indirect effects on respondents' saving habits.

We have further explored the relationship between financial socialization, self-control and different types of financial products using a multivariate framework that controls for the presence of shared unobserved heterogeneity among variables. Our results from this analysis suggest that the relevance of financial socialization depends on the type of financial product being examined. People who received financial education at home, either through teachings about money or by direct exposure to financial instruments, are more likely to hold insurances, retirement accounts and financial assets. However, the tenure of educational loans of checking accounts is not related to teachings received from family. Similarly, people with high self-control scores are more likely to hold retirement accounts and financial assets, whereas this variable is not significant for explaining the ownership of the other types of assets.

Finally, we have examined the determinants of automated retirement and non-retirement saving accounts. Interestingly, we find that both financial socialization and self-control are significantly and positively related with the decision to automatically transfer savings to both types of automated saving accounts.

In our regressions, we have controlled for several demographic and socio-economic characteristics. Our findings are robust to different definitions of our variables of interest. We highlight the fact that our measure of financial socialization is broader than the ones previously used in the literature. Our indicator does not only consider 'theoretical' teachings about good financial behavior but also 'practical' teachings about how to manage a regular allowance. We believe that financial socialization is better identified with our measure than it was in earlier research.

Overall, our results support the role of parental socialization and self-control as important drivers of saving behavior. As indicated earlier, we are cautious when interpreting the effect of self-control on saving decisions since our measure of this dimension might not be totally representative of self-control in the finance domain.

Our results have relevant policy implications. Since we provide robust evidence of financial socialization and self-control being two important drivers of financial behavior, it seems that parents should place greater attention on the economic-related teachings given to their children. This is especially important as higher self-control appears also to be an intermediate outcome of parental teachings received in young age. Knowing that self-control skills matter not only for financial behaviors, but also for consumer choices, interpersonal relationships and emotional problems, improving financial socialization practices warrants additional emphasis. Making children participate in household discussions about every day financial decisions, stressing them the importance of saving and to adjust their expenditures to the budget constraint, or managing a

regular allowance early in childhood are some examples of financial socialization practices parents should put into action with their children.

Nevertheless, our study has some limitations that should be pointed out. The main limitation is that it our measure of self-control is self-reported, and this is not free of bias. People may overestimate their capacity to control themselves. Future research might try to replicate our analysis by means of experimental protocols that elicit self-control in a more objective way. Another drawback is that we lack information on individual's risk aversion and non-cognitive abilities other than self-control (i.e. patience and temperament), which could also be relevant for characterizing the saving pattern behavior. In addition, our study relies on cross-sectional data. A valuable avenue for further research could be to examine the role of financial socialization and self-control using longitudinal data, which could provide further insights into the dynamics of these variables and financial behavior. Further research may also compare how saving habits and experiences vary by gender. This would be beneficial to provide a better understanding of the determinants of financial decisions. In addition, it might be interesting to explore the relationship between financial socialization, self-control and other relevant dimensions such as future orientation.

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Appendix A. NFWBS: exact wording of the questions

A.1. Financial products and services

The NFWBS asks respondents to select which financial products and services they currently have from an exhaustive list including checking or savings accounts, life or health insurance, retirement or pension account, non-retirement investments and education loan. The exact wording of the questions and the distribution of responses is reported in Table A.1. We grouped categories 2 and 3 in a variable representing "Insurance", categories 4 and 5 in a variable representing "Retirement accounts" and categories 7 and 8 in a variable representing "Educational loans". We model each category as a binary variable taking the value one if the respondent currently holds the specific financial product or service, and zero otherwise.

Table A.2. Financial products and services

[NFWBS variable name: PRODHAVE]
Question: *"Which of the following financial products and services do you currently have?"*
Possible answers: *"Yes"*; *"No"*

		Answer: *"Yes"* N (fraction)
1	Checking or Savings Account at a bank or credit union	2,501 *(0.87)*
2	Life Insurance	1,555 *(0.54)*
3	Health Insurance	2,104 *(0.74)*
4	Retirement Account (such as a 401k or IRA)	1,765 *(0.61)*
5	Pension	1,043 *(0.36)*
6	Non-Retirement Investments (such as stocks, bonds or mutual funds)	983 *(0.34)*
7	Education Savings Account (such as 529 or Coverdale)	202 *(0.07)*
8	Student/Education Loan (for yourself or someone else)	421 *(0.15)*
	Respondent did not select any item in PRODHAVE bank	87 *(0.03)*

Notes: The final sample includes 2,854 individuals interviewed in year 2016

Figure A.2: frequency distribution of responses (n=2,854)

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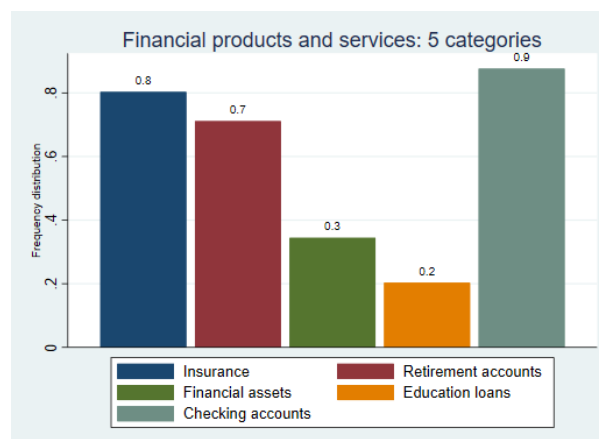
A.2. Saving strategies

Table A.2. Saving strategies

[NFWBS variable name: PRODHAVE]

Question: "Do you currently have money automatically transferred to:"

Possible answers: *"Yes"*; *"No"*; *"I do not have this type of account"*

		Answer: *"Yes"* N (fraction)
1	A Retirement Savings Account	1,230 *(0.43)*
2	A Non-Retirement Savings Account	1,196 *(0.41)*

Notes: The final sample includes 2,854 individuals interviewed in year 2016

A.3. Financial socialization

Table A.3. Financial socialization

[NFWBS variable name: FINSOC2]

Question: *"While growing up at home, did your family do any of the following?"*

Possible answers: *"Yes"*; *"No"*

		Answer: *"Yes"* N (fraction)
1	Discussed family financial matters with me	972 *(0.34)*
2	Spoke to me about the importance of saving	1,854 *(0.65)*
3	Discussed how to establish a good credit rating	1,013 *(0.35)*
4	Taught me how to be a smart shopper	1,724 *(0.60)*
5	Taught me that my actions determine my success in life	2,120 *(0.74)*
6	Provided me with a regular allowance	1,141 *(0.40)*
7	Provided me with a savings account	1,211 *(0.42)*

Notes: The final sample includes 2,854 individuals interviewed in year 2016

Appendix B. Relationship between self-control and financial socialization

Table B.1. Analysis of self-control

	(1) **Self-control**
Financial socialization	0.134***
	(0.016)
Age: 18-34	-0.003
	(0.016)
Age: 55-69	0.040***
	(0.014)
Age: >69	0.066***
	(0.016)
Female	0.001
	(0.011)
Married	0.024**
	(0.012)
No dependent children	-0.009
	(0.012)
College	0.027**
	(0.012)
Self-employed	0.018
	(0.018)
Good health	0.097***
	(0.011)
Area: Midwest	0.024
	(0.017)
Area: South	0.044***
	(0.015)
Area: West	0.035**
	(0.016)
Income <30k	-0.028*
	(0.016)
Income >100k	0.013
	(0.012)
Home owner	0.066***
	(0.014)
Constant	0.565***
	(0.024)
Avg. dependent variable	0.802
R-squared	0.121
Observations	2,854

Notes: This table presents OLS coefficients of a regression model of self-control on financial socialization including all the control variables. Robust standard errors in parentheses. ***, **, * denote significance at the 1 percent, 5 percent, and 10 percent levels respectively. Reference groups are: age between 35 and 54 (age), less than college (education), other employments (occupational status), medium income (income), house renter (housing property), Northeast (area of residence).

Appendix C. Further extensions

Age has also been frequently examined in previous research on saving behavior. We enrich here our benchmark analysis by looking at heterogeneity in saving habits across age groups. Specifically, we make a distinction between different generations in the effects of financial socialization and self-control on saving habits. Our dataset includes information about respondents' generation at the beginning of the survey field period in fall 2016. We focus on individuals aged between 18 and 35, who are defined as "Millennials"; among the generations, the Millennials are the largest group in the United States (Yao and Cheng, 2017). In Table C.1, the variables on financial socialization and self-control are interacted with generation, so that they capture the effects on millennials and other generations ("no Millennials" are individuals aged more than 35 at the beginning of the survey). In Column 1 the association between financial socialization and saving habits is larger among Millenials compared to other generations, possibly because they received financial socialization more recently compared to other generations. Thus, the influence of parenting on subsequent saving decisions seems to decrease as respondents grow older. When measures of self-control are included in models predicting saving habits by generation, financial socialization remains a significant variable (Column 2). Moreover, the amount of explained saving habits variance substantially increases when we include the interaction between generation and self-control in the model. As with financial socialization, we find a larger association between self-control and saving habits among Millennials. We interpret this finding as an indication that differences in self-control are related to individuals' cognitive maturation: individuals' attitudes towards saving may be less driven by short-term motives, which require self-control, as they age and become more independent.

Table C.1. Saving habits across generations

	(1) Saving habits	(1) Saving habits
Financial socialization (Millennials)	0.264*** (0.058)	0.183*** (0.059)
Self-control (Millennials)		0.452*** (0.062)
Financial socialization (no Millennials)	0.182*** (0.031)	0.133*** (0.030)
Self-control (no Millennials)		0.410*** (0.034)
Age: 18-34	0.047 (0.081)	0.062 (0.081)
Age: 55-69	0.038 (0.024)	0.021 (0.023)
Age: >69	0.020 (0.027)	-0.007 (0.026)

Female	-0.032*	-0.033*
	(0.018)	(0.018)
Married	0.005	-0.005
	(0.020)	(0.019)
No dependent children	0.054***	0.058***
	(0.020)	(0.020)
College	0.058***	0.046**
	(0.020)	(0.019)
Self-employed	-0.101***	-0.104***
	(0.036)	(0.034)
Good health	0.106***	0.066***
	(0.018)	(0.018)
Area: Midwest	-0.015	-0.026
	(0.027)	(0.026)
Area: South	0.036	0.016
	(0.025)	(0.024)
Area: West	0.038	0.023
	(0.027)	(0.026)
Income <30k	-0.074***	-0.065***
	(0.024)	(0.023)
Income >100k	0.109***	0.103***
	(0.022)	(0.021)
Home owner	0.112***	0.083***
	(0.021)	(0.021)
Generation: Millennials	-0.092	-0.123
	(0.090)	(0.103)
Log-Likelihood	-1771.600	-1679.348
Pseudo R-squared	0.098	0.145
Avg. dependent variable	0.550	0.550
Observations	2,854	2,854

Notes: Probit analysis by generation, coefficients (Columns 1 and 3) and average marginal effects (Columns 2 and 4) reported in panel (a). ***, **, * denote significance at the 1 percent, 5 percent, and 10 percent levels respectively.

Previous research also indicates that the influence of parenting on self-control differs by gender (Li *et al.*, 2019). Parents may tolerate certain behaviors from sons that would be quickly curtailed if displayed by daughters; in turn, differences in parental practices like monitoring and supervision may partially account for gender differences in self-control (Gottfredson and Hirschi, 1990). To shed more light on this issue, we repeat here our analysis on saving habits by making a distinction between males and females in our data. Results reported in Table C.2 reveal that in our sample the effect of financial socialization is larger among females (16 percentage points) as opposed to their male counterparts (12.4 percentage points). For both genders, we find a strong role of self-control in contributing to saving habits. Most interestingly, results from the mediation analysis by gender indicate that the mediating effect of self-control is higher among males: in this subsample we find that 31 percent (0.173/0.557) of the effect of financial socialization is attributable to self-control. All in all, this suggests that males' self-control may be largely built and developed through financial socialization. Conversely, females may display larger self-control to begin with, as part of their

behavioral and attitudinal traits. These findings provide only a first evidence about the factors explaining gender differences in saving habits and would benefit from further research. In-depth exploration of the associations between financial socialization, self-control and gender would be useful to determine what role each of these elements plays in fostering financial decisions.

Table C.2. Saving habits by gender

Panel a: regression results by gender

	Females		**Males**	
	(1)	**(2)**	**(3)**	**(4)**
	Saving habits		**Saving habits**	
	Coefficient	**Marginal effect**	**Coefficient**	**Marginal effect**
Financial socialization	0.463	0.160***	0.384	0.124***
	(0.118)	(0.040)	(0.112)	(0.036)
Self-control	1.035	0.357***	1.465	0.471***
	(0.133)	(0.043)	(0.137)	(0.039)
Socio-demographic controls		Yes		Yes
Area fixed effects		Yes		Yes
Log-Likelihood		-794.729		-874.244
Pseudo R-squared		0.126		0.161
Avg. dependent variable		0.498		0.593
Observations		1,312		1,542

Panel b: mediation analysis by gender

Financial socialization

(Total) Reduced		0.620***		0.557***
		(0.118)		0.112
(Direct) Full		0.463***		0.384***
		(0.118)		0.112
(Indirect) Diff		0.157***		0.173***
		(0.033)		0.036

Notes: Probit analysis by gender, coefficients (Columns 1 and 3) and average marginal effects (Columns 2 and 4) reported in panel (a). ***, **, * denote significance at the 1 percent, 5 percent, and 10 percent levels respectively. All regressions include the vector of socioeconomic variables listed in the previous tables. Reference groups are: age between 35 and 54 (age), less than college (education), other employments (occupational status), medium income (income), house renter (housing property), Northeast (area of residence). Panel (b): total, direct and indirect effects of financial socialization on saving habits. The mediator in the indirect effect is self-control.

Appendix D. Robustness checks on saving habits: estimation results

Table D.1. Robustness checks

	(1) Saving habits	(2) Saving habits	(3) Saving habits	(4) Saving habits	(5) Saving habits
Financial socialization	0.172***				0.138***
	(0.027)				(0.036)
Financial socialization: std 0-7				0.155***	
				(0.028)	
Financial socialization: items 1-5		0.115***			
		(0.023)			
Financial socialization: items 6-7			0.108***		
			(0.027)		
Self-control		0.419***	0.440***	0.421***	0.390***
		(0.029)	(0.029)	(0.029)	(0.038)
Self-control: resisting temptation	0.217***				
	(0.020)				
Age: 18-34	0.008	0.005	0.009	0.002	-0.003
	(0.025)	(0.025)	(0.025)	(0.025)	(0.026)
Age: 55-69	0.028	0.022	0.023	0.024	
	(0.023)	(0.023)	(0.023)	(0.023)	
Age: >69	-0.006	-0.008	-0.001	-0.003	
	(0.027)	(0.026)	(0.027)	(0.026)	
Female	-0.029*	-0.034*	-0.032*	-0.032*	0.119***
	(0.018)	(0.018)	(0.018)	(0.018)	(0.031)
Married	-0.002	-0.006	-0.007	-0.005	-0.003
	(0.019)	(0.019)	(0.019)	(0.019)	(0.026)
No dependent children	0.060***	0.061***	0.059***	0.058***	-0.058**
	(0.020)	(0.020)	(0.020)	(0.020)	(0.024)
College	0.059***	0.048**	0.046**	0.043**	0.007
	(0.019)	(0.019)	(0.019)	(0.019)	(0.027)
Self-employed	-0.101***	-0.107***	-0.103***	-0.105***	0.059**
	(0.035)	(0.034)	(0.034)	(0.034)	(0.025)
Good health	0.084***	0.068***	0.068***	0.065***	0.059**
	(0.018)	(0.018)	(0.018)	(0.018)	(0.026)
Income <30k	-0.080***	-0.068***	-0.068***	-0.065***	-0.038
	(0.024)	(0.023)	(0.023)	(0.023)	(0.033)
Income >100k	0.112***	0.105***	0.105***	0.103***	0.099***
	(0.021)	(0.021)	(0.021)	(0.021)	(0.028)
Home owner	0.097***	0.084***	0.081***	0.082***	0.068**
	(0.021)	(0.021)	(0.021)	(0.021)	(0.027)
Area: Midwest	-0.022	-0.027	-0.029	-0.027	
	(0.027)	(0.026)	(0.026)	(0.026)	
Area: South	0.024	0.015	0.017	0.016	
	(0.024)	(0.024)	(0.024)	(0.024)	
Area: West	0.025	0.022	0.016	0.022	
	(0.026)	(0.026)	(0.026)	(0.026)	
Log-Likelihood	-1716.850	-1681.705	-1686.673	-1679.608	-891.742
Pseudo R-squared	0.126	0.144	0.141	0.145	0.151
Avg. dependent variable	0.550	0.550	0.550	0.550	0.526
Observations	2,854	2,854	2,854	2,854	1,518

Notes: Univariate Probit analysis, average marginal effects reported. ***, **, * denote significance at the 1 percent, 5 percent, and 10 percent levels respectively. In Column 1 we replace our self-control index with an alternative binary variable representing the likelihood of resisting temptation. In Columns 2-4 we replace the original financial socialization index by alternative definitions as described in Sub-section 4.2. Column 5 reports regression results for a subsample of respondents younger than 50.

Table D.2. Saving habits: alternative definitions

Panel a: regression results

	(1) Money saved	(2) Propensity to plan	
		Coefficient	Marginal effect
Financial socialization	0.891***	0.279***	0.099***
	(0.168)	(0.079)	(0.028)
Self-control	1.337***	0.604***	0.215***
	(0.191)	(0.087)	(0.030)
Socio-demographic controls	Yes	Yes	
Area fixed effects	Yes	Yes	
Log-Likelihood		-1778.829	
(Pseudo) R-squared	0.413	0.032	
Avg. dependent variable	8.137	0.656	
Observations	2,445	2,854	

Panel b: mediation analysis

Financial socialization

(Total) Reduced	1.081***	0.359***	
	(0.167)	0.078	
(Direct) Full	0.890***	0.279***	
	(0.168)	0.079	
(Indirect) Diff	0.190***	0.081***	
	(0.036)	0.015	

Notes: Dependent variable in Column 1 represents the logarithm of the amount of money in savings currently held by respondents. The answer to this question is reported on a discrete scale with seven tiers between 0 and more than 75,000 USD. For each range we create a continuous variable equal to the central value; we set the variable equal to the threshold for the extreme values. Coefficients estimates using OLS regression model reported. Dependent variable in Column 2 takes the value 1 if the respondent engages in a lot of planning by consulting her budget, and 0 otherwise; coefficients and average marginal effects estimated through Probit reported. ***, **, * denote significance at the 1 percent, 5 percent, and 10 percent levels respectively. All regressions include the vector of socioeconomic variables listed in the previous tables. Reference groups are: age between 35 and 54 (age), less than college (education), other employments (occupational status), medium income (income), house renter (housing property), Northeast (area of residence).

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