Gender Differences in Financial Education: Evidence from Primary School

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Abstract

Financial and economic education is today a primary issue in academia and among policy makers and there is great interest towards programs able to boost it. In this paper we test whether a programme ("treatment") of financial education on savings, targeted to children aged 8 and 9, is effective and to what extent. We measure the interest rate required by the children before and after the treatment to accept to postpone a reward, compute its variation and compare this with that of a control group. We find that children are sensitive to the programme, and that this is helpful in decreasing the children's number of irrational responses. However, the program is effective in decreasing the impatience levels of males only. This deep gender difference casts some doubts about the gender neutrality of programmes of financial education.

Keywords: children; financial and economic literacy; savings; field study

JEL codes: A20; C93; G02

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1. Introduction

Educating people to take conscious decisions about their money and their savings is increasingly recognised as an important policy objective, with potentially high gains in term of individuals' welfare. In an environment where people are increasingly asked to provide autonomously for the coverage of the main life-course risky events as illness, old-age and unemployment rather than relying on governments, it is essential that they have the basic knowledge tools to cope with the task (Bucker-Koenen et al., 2012). For this reason, saving covers a central role in economic and financial literacy programs implemented in various countries.

Teaching people to save, basically implies teaching them to be patient and forward looking and the literature has documented several positive economic implications of that. Indeed, more patient individuals have better financial outcomes, since they search longer for a good job (DellaVigna and Paserman, 2005); experience steeper wage growth (Munasinghe and Sicherman, 2006); take up pension programs earlier (Fang and Silverman, 2006), have higher credit scores, and are less likely to default on their loans (Meier and Sprenger, 2007).

Several works identified women as "weak subjects" with respect to men in front of decisions involving their finance and highlighted how women seem more sensible to the framing of the economic and financial education programs and less confident in their financial competences, maybe as an effect of specialization within the family or of the traditional roles of women in society (Bucher Koenen 2012, Fonseca et al.).

Our paper tries to go at the roots of the problem analyzing females and males differential behavior in their childhood, when presumably the socialization problem is minimum. Moreover, as Boshara and Demmons (2015) and Drever et al. (2015) highlight, the foundations of financial knowledge and well-being are built during childhood. It contributes to the literature on three sides: It measures the initial level of patience of males and females; it tests the effectiveness of an easy-to-be-implemented program; it investigates gender differences in learning.

Our study is based on a project of the ****** (*** henceforth) aimed at teaching the children the importance of savings. In particular the project involves a one hour game accompanied by a short explanation of what saving means and for what savings may be used. This game was originally targeted to children and already used by the *** several times before we did. This repeated use and its brevity render it particularly suitable for the aims of our research, since they minimise the variability between the different sessions. Moreover it represents a program of financial literacy in early age easy to hand out to several children at a very reduced cost. As the program focusses on savings, we assess the impact of this treatment on the intertemporal discount rate of the treated, measuring it before and after the treatment, controlling for both the risk aversion of the subjects and for the learning effect (using a control group of non-treated). We find that male and female subjects start from similar levels of patience but respond differently to the treatment. In particular the behaviour of the male pupils is much more affected by the program than that of the females. In other words, it seems that the former learn from the game, while this is not the case for the latter. Such a result and its magnitude were unexpected and require deep reflections on how the programs of financial literacy are designed. In particular, if women are less responsive than men to the existing programs either the programs need revising, or different gender-specific programs are to be designed.

The remaining of the paper is organized as follows: section 2 presents the related literature on economic and financial education, section 3 introduces the study design and procedure, section 4 focusses on the empirical model used to analyse the results of the field experiment; section 5 provides the descriptive statistics; section 6 describes the results; section 7 concludes.

2. Related literature

The relevance of economic and financial literacy in the economics literature has grown during the last years. A number of papers deal with its effect on individuals' financial decisions (van Rooij et al., 2011), retirement choices (Lusardi and Mitchell, 2007 and van Rooij et al., 2012), participation

to mutual and pension funds, etc. This literature generally shows that financial literacy helps people to invest their savings and to take their retirement decisions in a more conscious way than individuals without any financial literacy do. A major question, however, is: when – in the life of an individual – should financial education start? Should it be treated as a "traditional" subject such as grammar, mathematics, geography, or should it be taught in parallel extra-curricular courses? There is in fact evidence that its level is low among young adults (Lusardi et al., 2010) and college students without financial education are more likely to be indebted than peers with some financial knowledge (Norvilitis et al., 2006). Young adults are savers and workers, and, as such, they must decide how to invest their savings and whether enter pension plans or not. This may suggest that young people should be exposed to financial education. However, strategies for educating the young (and especially the children) are still controversial and diverse, partly because also the empirical evidence on their effectiveness is inconclusive and points to different directions (McCormick, 2009). Some existing programs have indeed been targeted to children (Fox et al., 2005 and Kubasu and Ayuo, 2014) and have been effective (Moon et al., 2014).

From the USA (Fox et al., 2005) to the twenty-seven members of the EU (Habschick et al., 2007) governments, central banks and other primary financial institutions and authorities have designed and implemented programs of financial literacy in primary schools. Most of these programs have resulted effective in increasing the financial knowledge of the children. For example, Gross et al. (2005) use focus groups to assess the efficacy of financial education in the USA in a sample of undergraduate students. They find positive effects on the financial knowledge of the treated. Bayer et al. (2009) find similar results using a survey targeted to adults. Carlin and Robinson (2012) find that students who received a financial 19-hours financial literacy curriculum save more, repay debts faster and rely less on credit than peers who did not attend the same program. With reference to Italy, Becchetti et al. (2013) find that financial education in high-schools increases the propensity of the people to read economic articles in newspapers. Romagnoli and Trifilidis (2013) assess the

impact of a program of financial education in a sample of Italian primary schools; they find that the pupils treated with the educational program showed more financial knowledge that the non-treated peers one year after the treatment.

Batty et al. (2015) conduce a survey with children from primary schools in Wyoming US, who participated in a programme of financial literacy. In this case, they study the effect of a programme financed by the Council for Economic Education's Financial Fitness for Life, which involved pupils from the 3rd to the 5th grade. Teachers received specific preparation to deliver five classes of 45 minutes to their pupils, focussing on savings. The authors then measure the effectiveness of the treatment through a questionnaire. The authors show that the answers are reliable, as they pass the Cronbach test (though the scores are low, as the authors themselves highlight). The results show that the analysed programme increases the pupils' financial literacy and that this positive effect is still visible one year after the treatment. Our study proposes a similar work, where children play a game and are rewarded according to their decisions. While carrying out such a game with children may produce noised results, the provision of real incentives is likely to improve the reliability of the results with respect to a setting where no incentive is provided (Falk and Heckman, 2009).

As stressed before, our study focusses on gender, the existence of gender differences in financial knowledge and in the approach to financial investments is a well-known issue. Croson and Gneezy (2009) highlight that women are generally more risk averse than men, Migheli (2014) highlights that men are more prone to competition than women, and some claim that such an attitude may explain why men and women have different investment strategies (Powell and Ansic, 1997; Graham et al., 2002 and Hira and Loibl, 2008) A major issue in this domain is whether the gender differences are a matter of nature or of nurture. In other words, these differences may be explained by genetic factors, but also (or alternatively) by how women are educated and socialised. In particular, in the case of the gender gap in financial literacy, Fonseca et al. (2012) suggest that the cause relates more to how literacy is produced than on intrinsic (genetic) differences between the

genders. This suggests that specific investigation in this sense is suitable to understand which characteristics of the programs of financial literacy and to which extent are responsible for these gender-specific outcomes.

Children are not unusual subjects in economics inquiries: several works have provided empirical evidence on economic issues through studies with children (Holt, 1999; Bucciol et al., 2011; Bucciol and Piovesan, 2011); also children as young as 5 or 6 have proved to be reliable study subjects (Roos et al., 2005; Chan and McNeal, 2006 and Leiser and Halachmi, 2006). In particular, some of these works have used designs based on non-monetary incentives to teach children basic economics (Rupp, 2014). Of course, children do not always behave as the adults. Harbaugh et al. (2002) show that, when evaluating the probability of a gain or of a loss, children under-weigh low probabilities and over-weigh high probabilities much more than adults do. In a sample of adult Americans Bishai (2004) shows that inter-temporal discount rates decrease with age, but increase with IQ. Hence, children are not comparable to adults under many aspects; however, they are the target of many programs of financial literacy, and therefore assessing whether these are effective or not is interesting *per se* in order to test whether to continue providing them with these programs and to which topics they are the most sensitive.

This paper aims at adding evidence about the effectiveness of teaching children of primary schools the importance of savings and, in particular whether this teaching has different outcomes on children of different gender. Savings are the expression of individuals' time preferences for the allocation of money (income). These preferences are fundamental "in theories of savings and investment, economic growth, interest rate determination and asset pricing, addiction, […]"[1] Some studies have inquired how patient children actually are. Otto et al. (2006) show that children between 6 and 9 are already able to understand what saving is about and to allocate their money to savings programs. Bettinger and Slonim (2007) test this with a sample of subjects ages between 5

[1] Becker and Mulligan (1997), p. 729.

and 16; they find that boys are more impatient than girls, that mathematical scores at school are not predictors of patience and that children's choices are consistent with hyperbolic discount, i.e. children are able to take rational decisions (see also Castillo et al., 2001). However, Andersen et al. (2008) had already shown that adults' time preferences are consistent with hyperbolic discount and therefore, under this aspect, children and adults do not show significant differences in the ways they reason. This suggests that children are appropriate subjects for a study on time preferences.

In our work we use an approach that allows for evaluating the effectiveness of a program of financial education targeted to children. The advantage of such a policy evaluation is that it allows the evaluators for conducting a quasi-experiment, controlling for several characteristics of the subjects.

3. Study design and procedure

As already anticipated in the introduction, the aim of the paper is to test the effectiveness of an economic and financial education program addressed to teach pupils the importance of savings. The test is performed on the field, on a sample of pupils from the third and fourth year of five primary schools (i.e. children aged between 8 and 9) of **** and **** (a town immediately close to ****). We selected the schools randomly and we telephonically contacted the headmasters to explain the purposes of the research and to ask permission of proposing the questionnaires and the treatment to the pupils. Once the headmaster had accepted, s/he chose the class for the study. While this procedure was not completely random (the director of a school may have chosen the best class to give a good impression of the school), the pupils were not informed about the aims of the study, and the procedure was the same for all the schools involved. Given the age of the subjects we chose to base the survey on the strategy method (Selten, 1967), instead of using PCs in a lab. Andersen et al. (2006) show that, in spite of some flaws, this method produces robust findings about individuals' discount rates. Our procedure is very close to Andersen et al. (2008), but their subjects are adults,

their time horizon is longer (6 months in their case, one in ours) and we were not properly able to test for pupils'risk aversion.

We structured our test in four phases. In the first phase we asked to the pupils to answer to a basic socio-demographic questionnaire at home, with the help of their parents. In the second phase, the subjects were involved in a game aimed at measuring their patience level (from now on called the game-P). The game-P consists in filling the questions reported in table B1 (see Appendix B). The first question asks whether they prefer 10 candies the day after (choice A) or 11 candies in one month[2] (choice B). The following questions are identical, but the pay-off for the wait is gradually increasing up to 20 candies. The switching point - i.e. the row at which the subject changes its preference between choice A and choice B - gives information about the individuals' level of patience. We use it as a proxy of the inter-temporal discount rate of the child. Of course, the discount rates implied by the game are very high compared to the reality, but this is common in studies on this topic as the time between two phases of such studies is usually limited (see for instance Andersen et al., 2008, where the annualized interest rates of the game are clearly out-of-market). To provide pupils with an incentive to spend effort, at the end of the game a number from 1 to 10 has been drawn from the urn. This identified the "winning row" in correspondence of which the possible outcome was actually paid.

The third phase, that took place one week later, consists in what we call the "treatment". The treatment, conceived by the ***, is a one-hour laboratory aimed at making the children familiar with the idea and the utility of saving. Becker and Mulligan (1997) point out that the intertemporal discount factor is endogenous and the simple fact of focusing the attention on the consumption opportunities available in the future makes individuals more patient. First, pupils were requested to draw something they would desire to have on a paper. This wish could be a good (a car, a musical instrument, a new pair of shoes, etc.), a pet (dog, cat, horse, etc.) or something else that can be

[2] The researchers used some examples to clearly rise in the pupils the awareness of what waiting for one month means.

bought in the market such as for example a dance course or a travel. Adults involved in supervising the laboratory strictly avoided any potential influence on pupils' desires. After the drawings are done (it took about 15 minutes) the children are seated in front of a board, and one of the researchers invites them, through some examples, to meditate on the amount of money they would need to realize their dreams. In particular, the children are shown that their weekly pocket money are most of the times not sufficient to immediately buy what they want. However, saving these weekly amounts for a certain period, in the end can provided them with the necessary sum. To reinforce the concept, they are then involved in an additional game. The children were given a picture of some good (a photo camera, a bike, a dollhouse, a videogame) reporting the market price below. Then they received a sort of calendar and the researcher gave a specimen of a 5-euro note to each of them. This amount was insufficient to buy any of the goods represented in the pictures previously given to the subjects. The researchers showed them that they would have had to receive other notes before being able to buy the goods in the pictures. The children were then invited to put the received note in the first cell of the calendar. Then a second note was given to them, and they are asked to put it in the second cell of the calendar and so on, until each of them had enough money to buy the good in the picture. Each 5-euro note represented their weekly pocket money, while the number of filled cells in the calendar represented the number of weeks they had to save their pocket money before being able to buy the good in the picture.

In phase four, the children play again the game-P. Not all children went through all the four phases. A group of them was not involved in phase three, but simply played the game-P two times at a distance of one week. The comparison between the two groups allows to isolate the "treatment effect", i.e. the effect of the *** laboratory, from the effect due to the repetition of the game ("learning effect"): the game-P itself is likely to increase the financial literacy of the children, as they face a choice that involves a reward for their patience.

This treatment differs substantially from those generally assessed by the literature for at least two reasons. First, it is not an out-and-out course; rather it is a one-hour activity aimed at familiarising the children with the concept of "savings". Second, it is administered in a non-institutional framework (i.e. not between the walls of a school). Nevertheless, it is important to assess its effectiveness for a number of different reasons. First, it is a form of financial literacy that can be easily administered by the *** (or by many other institutions) to the children who visit it. Second, it is a short extra-curricular activity and therefore might meet the parents' appreciation more easily than longer activities. Third, given its structure and duration it may reach a large number of beneficiaries at small cost. Fourth, if effective, it could stimulate the children's and their parents' interest for further education on the topic. Of course, a one-hour activity may have limited effects on the children's literacy, but will also reveal how much sensitive and receptive children are with respect to this kind of subject. In sum, we think that also this treatment can potentially contribute to develop some financial culture among children and can offer evidence about the effectiveness of such programmes for children. Moreover, evidence in favour of its effectiveness will provide ground for further expansion of this programme not only in ****, but also elsewhere.

4. Empirical model

The aim of our empirical analysis is to understand whether the ***'s treatment is effective on the children. In other words, we would like to test the children's attitude to save before and after the treatment in order to understand whether they have actually learned what saving means. We do this by measuring the level of patience shown by the children before and after the treatment. We therefore perform a difference-in-differences analysis, as described in this section of the paper.

Let us identify as "treatment group" the children involved in the *** laboratory and as "control group" the children not involved in it. Let a and b denote the two time periods in which children are asked to play the game-P for the first and the second time, and the *** laboratory be given at some time between a and b. Each child is observed twice (we work with a balanced panel). Define

dummy G=1 if individual participate in the *** laboratory (i.e. is treated) and dummy T=1 if the time period is equal to b. Belonging to the treated group at time b (d_{it}) means receiving the treatment (D_{it}=G*T).

Let now y_{jit} denote the potential response in game-P for children i of the group j (where j=1 if she is part of the treated group, j=0 if she is in the control group) at time t. The observed response y_{it} is

(1) $y_{it}=(1-D_{it})y_{0it}+D_{it}y_{it}$

Omitting the subscript i, the difference in difference is :

(2) $DD=E(y_b-y_a|G==1)- E(y_b-y_a|G==0)$ in observed responses

$= E(y_{1b}-y_{0a}|G==1)- E(y_{0b}-y_{0a}|G==0)$ in potential responses

If in equation (2) we subtract and add the counterfactual $E(y_{0b}-y_{0a}|G==1)$ and we assume that the treated and the control groups have the same learning effect from the repetition of the game (the so called parallel trend assumption), i.e.

(3) $E(y_{0b}-y_{0a}|G==1)= E(y_{0b}-y_{0a}|tG==0)$

then

(4) $DD= E(y_{1b}-y_{0b}|G==1)$

identifies the treatment effect for the treated group at time b (Lee, 2005). The control and the treated groups may differ systematically, but as long as the learning effect condition holds (eq.(3)), the difference will not matter. To make the learning effect condition more plausible, we condition all the derivations reported above to observed covariates at the two periods. The two groups may differ in some unobserved variables affecting the baseline response y_{0a}, but the same time-effect condition will involve only the change $y_{0b}-y_{0a}$. In this sense, DD allows for unobserved confounders.

In this paper we estimate the effect of the *** laboratory both on the patience level of students who provide rational answers (a sort of intensive margin effect) and on the probability of giving an

irrational response (a sort of extensive margin effect). To estimate the effect of the *** laboratory on the patience level of students who provide rational answers we consider a linear potential response equation and we estimate the following specification:

(5) $Y_{jit}= \beta_G$ group+ β_T time+ β_d(group*time)+ $\beta_1 x+u_{jit}$

where $E(u_{jit}=0)$.

As $y_{1it}-y_{0it}= \beta_D+ u_{1it}-u_{0it}$, β_D is the main parameter of interest and identifies an "externally valid" treatment effect, i.e. an effect valid not just for the control group but also for all the other groups at all times as it assumes $E(u_{1b}-u_{0b}|G=1)=0$. In the estimates we also allow for the presence of an individual specific time invariant component of the error term ε_{ji} with non zero mean.

To evaluate the effect of the treatment on irrational responses, we run a probit. In nonlinear models such as probit, the treatment effect cannot be constant across treated populations, because the expectation of the outcome variable is bounded (Athey and Imbens 2006). To address this issue, we apply the difference in difference assumption of a constant difference between groups across time to the unobserved latent linear index. Puhani (2012) shows that modelling the latent linear index similarly to the linear model of the limited dependent variable, the treatment effect is defined as:

(6) $E[Y1|G=1, T=1, X]-E[Y0|G=1,T=1,X] = \Phi(\beta_G$ group+ β_T time+ $\beta_D+ \beta_1 x)+\Phi(\beta_G$ group+ β_T time+ $\beta_1 x)$

The Probit difference in difference model is then:

(7) $E[Y|Treated,Time,X]= \Phi(\beta_G$ group+ β_T time+ β_D(group*time)+ $\beta_1 x)$

Because Φ is a strictly monotonic function, the coefficient of β_d is equal to the sign of the treatment effect and the treatment is zero if and only if the coefficient β_d is zero. However, the effect of the treatment is the incremental effect of the coefficient β_d. Analogously, $\beta_{treated}$ and β_{time} do not directly identify the dimension of the time effect (constant across groups) and of the group effect (constant across time), but still there would be no time and no group effect if they are zero. As before, in the

estimates we also allow for the presence of an individual-specific time-invariant component of the error term ε_{ji} with non-zero mean.

Before showing the results obtained through the application of this procedure, in the next section we present the main descriptive statistics of our data, in order to render the framework clearer for the reader. A major issue that will emerge is that of children who showed "irrational" behaviours. Our analysis aims also at understanding whether the treatment helps reducing these "irrational" attitudes.

5. Descriptive statistics

Our initiative involved 173 children attending the third and fourth grades of a sample of 5 primary schools of **** and ****. We exclude from the analysis pupils who were absent in one of the two games and those who did not answer the socio-demographic questionnaire and 3 pupils of the control group behaving as outliers, with too high leverage on the results; so we end up with a treatment group of 117 and a control group of 48 pupils.

We start considering game-P: when the switching point is unique, the higher the number of choices A, the higher the impatience of the child. However, many students reported multiple switching points in game-P. The interpretation of this choices in literature is controversial (see Andersen et al. 2006). Multiple switching points can either identify indifference between choices or signalling the fact that the subjects did not understand the rationale behind the game. We have a proclivity for this last interpretation and we classify these multiple switching choices as irrational behaviour. The number of irrational responses is about 22% the first time the children plaid the game (see outcomes of game-P in t=a in table 1) and decreases to 18% the second time (see outcomes of game-P in t=b in table 1). The incidence is initially equal for both genders. However, a striking gender difference emerges in game-P in t=b: for male pupils irrational responses halve, for females they actually increase, shifting from 22% to 27%.

Among the group of pupils who provided rational responses, the variability in the answers is high, but on average the repetition of the game leads to a reduction in the impatience level (Table 2).

Table 3 presents the descriptive statistics. We disentangle the group of individuals providing rational responses and the group providing irrational responses; furthermore we partition them between treated and members of the control groups. A first exploration of the data (Table 3) highlights how the control group differs from the treated group in the share of high educated parents and of pupils receiving a weekly allowance and having savings; these shares are lower in the control than on the other group, an evidence that suggests to resort to difference-in-difference econometric approach. Among children giving irrational responses there is a higher percentage of females, children receiving a weekly allowance and pupils with low math grades with respect to the children giving rational responses.

6. Results

We first look at the effect of our initiative on the patience levels of pupils who provided rational responses (with one unique switch point in both the games B). Our dependent variable is the impatience score of pupils given by the number of answers A in game-P before the child switches to answer B at any time t (t=a, b). A negative sign of the regressor reveals that the treatment reduced the pupil's level of impatience.

We start with the simplest specification and we regress the patience score on the time dummy (time), the group dummy that identifies the treated group (treated) and the treatment dummy (D=treated*time). The time dummy captures the learning effect due to the repetition of the game. The treatment dummy identifies the effectiveness of the *** laboratory. The group dummy detects the systematic differences between the control and the treated groups. We find evidence of a substantial initial difference between the treated and the non-treated, but no evidence of a significant learning effect nor of a significant treatment effect.

We then run other specifications with a richer set of explanatory variables; namely we add gender of the pupil, education of her parents, presence of younger and/or older siblings, pupil's math grade, whether she receives a weekly allowance, whether she has own savings[3]. These socio-demographic characteristics appear to be correlated with the being in the treated group and their introduction improves the significance level of some key regressors. In particular, the learning effect captured by the dummy time is now negative and significant (at 10 per cent level); this suggests that the repetition of the game-P induces pupils to be more patient. The treatment does not appear to be effective in reducing the impatience level: the coefficient of the dummy is indeed negative but non significantly different from zero at any conventional level.

However, conclusions change if we allow for gender specific effects. In specification (iii) and (iv) we interact the time, the group and the treatment dummies with the gender and we find that, while for females the treatment and the repetition effects remain non-significant, for males they are both negative and significantly different from zero. According to our estimates, our initiative reduces the impatience score of males by about 1 point and about 80 per cent of such an effect is attributable to the *** laboratory.

Fixed effect estimation proposed in specification (iv) prevents estimated coefficients to be biased in case of correlation with the unobserved time invariant component of the error term. The relative invariance of the standard errors of the estimated coefficients with respect to specification (iii) should suggests the absence of any relevant endogeneity issue.

Interestingly, regressions (ii) and (iii) reveal also a systematic difference in the patience levels across genders, with man more patient than women, and an important role of the variable proxing

[3] Game B rewards pupils with a prize in candies that depends on their choice in a randomly chosen row of the table B1 in Appendix B, as explained in section 2. One can argue that this endowment in candies, that is introduced between time a and time b, can influence the outcomes of game-P in time b, a consideration that suggests to introduce the amount of candies won in game-PB at time a among the regressors of our estimated model. However, we decided not to proceed in this sense as: 1. It is reasonable to assume that pupils almost have an infinite endowment of candies at home independently of the prize won in game-P at time a; 2. Game-P is repeated at a distance of one week and it is very likely that pupils have completely consumed their endowment from game-P in time a in the meanwhile.

the educational and economic level of the household. Pupils coming from the upper class households, i.e. with a higher educated fathers and with own savings, are on average more impatient. A possible explanation for this result is that these children get presents and toys more easily than their peers from less wealthy households. Therefore, the former are used to obtain more and in a shorter time than the latter, what makes the children from the upper class more impatient that the others on average.

Moreover, we investigate the effects of the treatment on the rationality of the responses. The dependent variable is a dummy variable equal to one if the child provided an irrational response (multiple switching points between A and B) in game-P either at time a or b. In our first specification, we estimate a random effect probit model using the time trend, the group dummy and the interaction between the treatment and the group as regressors. We find evidence of a significant and negative group effect and of a significant and negative treatment effect. The treatment effect appears to be reinforced once we add additional explanatory variables (see specification (ii) in table 5). The probability of an irrational response decreases of about 0.66 percentage points when children attend the *** laboratory. If we split the time, group and treatment dummies by gender, we find that the treatment effect is actually slightly driven by males. Interestingly, the repetition of the game-P itself sorts a worsening in the rationality of the answers. This is probably due to a decrease in the attention/interest of pupils in the game.

Specifications (ii) and (iii) also reveal a higher incidence of irrational responses among children with lower math grades and belonging to upper class households (proxied by the educational level of parents and by the fact of receiving a weekly allowance).

7. Conclusions

The original idea of this work is to test whether inducing children to reflect on the meaning and the importance of savings is effective in increasing their level of patience, and, in particular, if there is some difference in how female and male pupils react to these reflections. We acknowledge that this is induced through a game and the duration of the treatment is much shorter than the usual programmes of financial literacy are, and that this represents a sort of "lower bound" for more structured programmes. However, this constitutes a strength of the analysis: since gender differences emerge even in such a "weak" setting, then it means that they are particularly strong and therefore the designers of financial literacy programs should pay much attention to the gender issue.

We find evidence that 1) the treatment is effective on pupils, 2) with a systematic difference in outcomes across genders. Participation in the initiatives leaves females patience levels basically unaffected, while it reduces the impatience level of males of about 1 point out of a (hypothetical) scale of 10. About 80 per cent of such a variation is merit of the *** laboratory, the rest is instead imputable to the learning effect due to the repetition of the game. The treatment significantly reduces also the incidence of irrational responses, that initially is about 20 per cent and that is decreased of about 0.66 percentage points if the pupil attends the *** laboratory. This effect may also explain why women are found to be less literate than men on average, also in adult ages. Boggio et al. (2014) suggest that the language used in financial communication tends to use words and images that recall male stereotypes. The authors argue that this may be responsible of different levels of responsiveness of men and women to the programmes of financial literacy. Although it was not intentional, the same bias may have affected the design of our game, and might contribute to explain this gender bias.

On the one hand, the policy indication that emerges from our work is that the investment in the education to saving of children produces the desired effects. On the other hand, our results suggest

also that education programmes should be improved to overcome the gender differences found in this study. Further research shall investigate what determines this gender difference, in order to promote programmes of financial literacy that obtain the same results on both male and female subjects.

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Table 1 – Rational and irrational responses in game-P in t=a and game-P in t=b

	Game-P in t=b							
	Men				Women			
Game-P in t=a	Rational	Irrational	Total		Rational	Irrational	Total	
			n.	%			n.	%
Rational	62	2	64	77%	49	13	62	78%
Irrational	12	7	19	23%	9	8	17	22%
Total	74	9	83	100%	58	21	79	100%
%	89%	11%	100%		73%	27%	100%	

Note: we consider as irrational responses all the cases in which the individual switches from A to B more than 1 time per game

Table 2 – Impatience levels of children in game-P in t=a and game-P in t0b2

	Game-P in t=a		**Game-P in t=b**	
	Female	Males	Female	Males
Mean	4.49	5.05	4.33	4.03
Median	5	5	4	3
Standard deviation	4.21	4.36	4.00	4.12
N.	49	62	49	62

Table 3 - Descriptive Statistics

	Treated group					Control group				
	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max
Group of children providing Irrational responses										
Male	28	0.36	0.49	0	1	23	0.48	0.51	0	1
Education-father: High school	27	0.44	0.51	0	1	21	0.52	0.51	0	1
Education-father: University	27	0.41	0.50	0	1	21	0.00	0.00	0	0
Education-mother: High school	27	0.41	0.50	0	1	21	0.48	0.51	0	1
Education-mother: University	27	0.44	0.51	0	1	21	0.14	0.36	0	1
Elderly siblings	26	0.35	0.49	0	1	22	0.36	0.49	0	1
Young siblings	26	0.35	0.49	0	1	21	0.67	0.86	0	3
Math grade	26	8.00	0.98	6	9	21	8.10	1.18	6	10
Weekly Allowance	26	0.54	0.51	0	1	21	0.29	0.46	0	1
Savings	26	0.81	0.40	0	1	22	0.50	0.51	0	1
Group of children providing rational responses										
Male	89	0.54	0.50	0	1	22	0.64	0.49	0	1
Education-father: High school	86	0.41	0.49	0	1	22	0.45	0.51	0	1
Education-father: University	86	0.41	0.49	0	1	22	0.00	0.00	0	0
Education-mother: High school	87	0.38	0.49	0	1	22	0.55	0.51	0	1
Education-mother: University	87	0.51	0.50	0	1	22	0.09	0.29	0	1
Elderly siblings	86	0.48	0.63	0	2	21	0.38	0.59	0	2
Young siblings	85	0.52	0.89	0	7	20	0.45	0.60	0	2
Math grade	83	8.39	0.81	7	10	18	8.61	0.61	8	10
Weekly Allowance	82	0.32	0.47	0	1	20	0.00	0.00	0	0
Savings	80	0.89	0.32	0	1	20	0.55	0.51	0	1

Table 4 – Effect of the treatment on the impatience level (group of individuals with rational answers)

	(i) Random-effects GLS regression	(ii) Random-effects GLS regression	(iii) Random-effects GLS regression	(iv) Fixed-effects (within) regression
	b/se	b/se	b/se	b/se
Time (T)	-0.500	-0.444*		
	(0.346)	(0.261)		
Group (G)	-5.179***	-6.152***		
	(1.285)	(1.517)		
Treatment effect (D=T*G)	-0.174	-0.356		
	(0.445)	(0.403)		
Man		0.557	1.200**	.
		(0.785)	(0.506)	.
Education-father: High school		1.138**	1.187***	.
		(0.479)	(0.417)	.
Education-father: University		1.536*	1.532*	.
		(0.805)	(0.799)	.
Education-mother: High school		0.736	0.687	.
		(0.589)	(0.620)	.
Education-mother: University		0.436	0.442	.
		(0.672)	(0.706)	.
Elderly siblings		-0.324	-0.346	.
		(0.366)	(0.367)	.
Young siblings		-0.409	-0.424	.
		(0.385)	(0.397)	.
Math grade		-0.294	-0.309	.
		(0.586)	(0.590)	.
Weekly Allowance		-0.165	-0.136	.
		(0.672)	(0.699)	.
Savings		1.340**	1.339**	.
		(0.553)	(0.538)	.
Time (T)*man			-0.364**	-0.364**
			(0.157)	(0.152)
Time (T)*woman			-0.571	-0.571
			(0.549)	(0.530)
Group (G)*man			-6.293***	.
			(1.347)	.
Group (G)*woman			-5.967***	.
			(1.797)	.
Treatment effect (D)*man			-0.836*	-0.836°
			(0.471)	(0.455)
Treatment effect (D)*woman			0.371	0.371
			(0.717)	(0.693)
Constant	8.955***	9.531**	9.297*	4.613***
	(0.585)	(4.745)	(4.746)	(0.122)
Sigma u	2.925	2.685	2.700	3.715
Sigma e	2.124	2.290	2.293	2.293
Rho (fraction of variance due to u_i)	.655	.579	.581	0.724
N	222	186	186	186

Note: Error terms clustered at class level. Standard errors in parentheses. *** p <0.01, ** p <0.05, * p <0.10, °p= 0.109.

Table 5 – The effect of the treatment on the irrational responses – Random Effect Probit

	(i) RE probit b/se	(ii) RE probit b/se	(iii) REprobit b/se	(i) mfx b/se	(ii) mfx b/se	(iii) mfx b/se
Time (T)	0.084	0.344*		0.082	0.335**	
	(0.140)	(0.183)		(0.132)	(0.162)	
Group (G)	-0.695***	-0.519*		-0.620**	-0.406	
	(0.268)	(0.293)		(0.292)	(0.295)	
Treatment effect (T*G)	-0.453*	-0.665**		-0.455*	-0.662**	
	(0.258)	(0.334)		(0.255)	(0.327)	
Man		-0.614***	0.158		-0.712***	-0.136
		(0.220)	(0.123)		(0.253)	(0.088)
Education-father: High school		0.211	0.268		0.113	0.136
		(0.331)	(0.308)		(0.292)	(0.278)
Education-father: University		0.394	0.485		0.306	0.384
		(0.285)	(0.295)		(0.271)	(0.298)
Education-mother: High school		-0.202	-0.220		-0.266	-0.290
		(0.258)	(0.268)		(0.285)	(0.296)
Education-mother: University		-0.592**	-0.679**		-0.635**	-0.735**
		(0.300)	(0.338)		(0.306)	(0.353)
Elderly siblings		-0.177	-0.228		-0.192	-0.230
		(0.320)	(0.306)		(0.321)	(0.301)
Young siblings		-0.229	-0.270		-0.203	-0.239
		(0.190)	(0.227)		(0.183)	(0.212)
Math grade		-0.313***	-0.343***		-0.313***	-0.344***
		(0.111)	(0.121)		(0.107)	(0.118)
Weekly Allowance		1.027***	1.124***		1.003***	1.105
		(0.245)	(0.247)		(0.251)	(0.249)
Savings		-0.169	-0.184		-0.118	-0.139
		(0.143)	(0.172)		(0.127)	(0.139)
Time (T)*man			-0.269			-0.252
			(0.444)			(0.410)
Time (T)*woman			0.837			0.844
			(0.749)			(0.753)
Group (G)*man			-0.774***			-0.489*
			(0.263)			(0.294)
Group (G)*woman			-0.437			-0.416
			(0.423)			(0.430)
Treatment effect (D)*man			-1.079*			-1.115*[#]
			(0.649)			(0.655)
Treatment effect (D)*woman			-0.628			-0.633
			(0.820)			(0.827)
Constant	-0.604***	2.257**	2.136*			
	(0.133)	(1.107)	(1.105)			
lnsig2u	-0.009	-0.561	-0.240			
_cons	(0.000)	(0.000)	(0.000)			
N	324	272	272			

Note: Error terms clustered at class level. Standard errors in parentheses. *** p <0.01, ** p <0.05, * p <0.10. # mfx greater than one due to linear approximations.

Appendix

Table A1 – The effect of the treatment on the irrational responses – Random Effect Probit – without excluding the 3 high leverage observations

	(i) RE probit b/se	(ii) RE probit b/se	(iii) RE probit b/se
Time (T)	0.082	0.335**	
	(0.132)	(0.162)	
Group (G)	-0.620**	-0.406	
	(0.292)	(0.295)	
Treatment effect (T*G)	-0.456*	-0.662**	
	(0.255)	(0.327)	
Man		-0.712***	-0.136
		(0.253)	(0.088)
Education-father: High school		0.113	0.136
		(0.292)	(0.278)
Education-father: University		0.306	0.384
		(0.271)	(0.298)
Education-mother: High school		-0.266	-0.290
		(0.285)	(0.296)
Education-mother: University		-0.635**	-0.735**
		(0.306)	(0.353)
Elderly siblings		-0.192	-0.230
		(0.321)	(0.301)
Young siblings		-0.203	-0.239
		(0.183)	(0.212)
Math grade		-0.313***	-0.344***
		(0.107)	(0.118)
Weekly Allowance		1.003***	1.105***
		(0.251)	(0.249)
Savings		-0.118	-0.139
		(0.127)	(0.139)
Time (T)*man			-0.252
			(0.410)
Time (T)*woman			0.844
			(0.753)
Group (G)*man			-0.489*
			(0.294)
Group (G)*woman			-0.416
			(0.430)
Treatment effect (D)*man			-1.115*
			(0.655)
Treatment effect (D)*woman			-0.633
			(0.827)
Constant	-0.696***	2.260**	2.219**
	(0.170)	(1.090)	(1.092)
lnsig2u	0.046	-0.466	-0.132
_cons	(0.000)	(0.000)	(0.000)
N	330	278	278

Table A2 – The effect of the treatment on the impatience level (group of individuals with rational answers) – without excluding the 3 high leverage observations

	(i) Random-effects GLS regression b/se	(ii) Random-effects GLS regression b/se	(iii) Random-effects GLS regression b/se	(iv) Fixed-effects (within) regression b/se
Time (T)	-1.333***	-1.429***		
	(0.326)	(0.525)		
Group (G)	-3.630***	-4.611***		
	(0.976)	(1.396)		
Treatment effect (D=T*G)	0.788*	0.701		
	(0.467)	(0.619)		
Man		-0.055	1.206***	.
		(0.757)	(0.455)	.
Education-father: High school		0.895**	1.098***	.
		(0.418)	(0.310)	.
Education-father: University		1.493*	1.536*	.
		(0.853)	(0.838)	.
Education-mother: High school		0.196	0.150	.
		(0.388)	(0.430)	.
Education-mother: University		-0.354	-0.305	.
		(0.518)	(0.486)	.
Elderly siblings		-0.716*	-0.794*	.
		(0.421)	(0.422)	.
Young siblings		-0.498	-0.509	.
		(0.348)	(0.356)	.
Math grade		-0.227	-0.249	.
		(0.351)	(0.365)	.
Weekly Allowance		0.186	0.174	.
		(0.474)	(0.474)	.
Savings		0.897*	0.928**	.
		(0.501)	(0.430)	.
Time (T)*man			-1.059***	-1.059***
			(0.124)	(0.121)
Time (T)*woman			-1.778*	-1.778
			(1.020)	(0.997)
Group (G)*man			-5.241***	.
			(1.217)	.
Group (G)*woman			-4.096***	.
			(1.546)	.
Treatment effect (D)*man			-0.256	-0.237
			(0.508)	(0.494)
Treatment effect (D)*woman			1.725*	1.757
			(1.076)	(1.049)
Constant	7.778***	9.403***	8.920***	5.041***
	(0.233)	(3.019)	(3.008)	(0.143)
Sigma u				
Sigma e				
Rho (fraction of variance due to u_i)				
N	330	274	274	274

Appendix B

Table B1 – Game-P

	Option A	**Option B**	**ANSWER**
	I receive … candies tomorrow	I receive … candies in 1 month?	Do you prefer A or B?
Row 1	10 candies	11 candies	
Row 2	10 candies	12 candies	
Row 3	10 candies	13 candies	
Row 4	10 candies	14 candies	
Row 5	10 candies	15 candies	
Row 6	10 candies	16 candies	
Row 7	10 candies	17 candies	
Row 8	10 candies	18 candies	
Row 9	10 candies	19 candies	
Row 10	10 candies	20 candies	