

Kalwij, Adriaan S. et al.

Working Paper

The effects of financial education on financial literacy and savings behavior: Evidence from a controlled field experiment in Dutch primary schools

U.S.E. Discussion Papers Series, No. 17-05

Provided in Cooperation with:

Utrecht University School of Economics (U.S.E.), Utrecht University

Suggested Citation: Kalwij, Adriaan S. et al. (2017) : The effects of financial education on financial literacy and savings behavior: Evidence from a controlled field experiment in Dutch primary schools, U.S.E. Discussion Papers Series, No. 17-05, Utrecht University, Utrecht University School of Economics, Tjalling C. Koopmans Research Institute, Utrecht

This Version is available at:

<https://hdl.handle.net/10419/322961>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



Utrecht University

School of Economics

The effects of financial education on financial literacy and savings behavior

Evidence from a controlled field experiment in Dutch primary schools

Adriaan S. Kalwij
Rob Alessie
Milena Dinkova
Gea Schonewille
Anna van der Schors
Minou van der Werf

**Tjalling C. Koopmans Research Institute
Utrecht University School of Economics
Utrecht University**

Kriekenpitplein 21-22
3584 EC Utrecht
The Netherlands
telephone +31 30 253 9800
fax +31 30 253 7373
website www.uu.nl/use/research

The Tjalling C. Koopmans Institute is the research institute and research school of Utrecht University School of Economics. It was founded in 2003, and named after Professor Tjalling C. Koopmans, Dutch-born Nobel Prize laureate in economics of 1975.

In the discussion papers series the Koopmans Institute publishes results of ongoing research for early dissemination of research results, and to enhance discussion with colleagues.

Please send any comments and suggestions on the Koopmans institute, or this series to J.M.vanDort@uu.nl

How to reach the authors

Please direct all correspondence to the first author.

Adriaan S. Kalwij*

Rob Alessie~

Milena Dinkova*

Gea Schonewille#

Anna van der Schors#

Minou van der Werf#

*Utrecht University
Utrecht University School of Economics
Kriekenpitplein 21-22
3584 TC Utrecht
The Netherlands.

E-mail: a.s.kalwij@uu.nl

~University of Groningen
Faculty of Economics and Business
Nettelbosje 2

9747 AE Groningen
The Netherlands

Nationaal Instituut voor Budgetvoorlichting
Arthur van Schendelstraat 550
3511 MH Utrecht

The effects of financial education on financial literacy and savings behavior: Evidence from a controlled field experiment in Dutch primary schools

Adriaan S. Kalwij^a
Rob Alessie^b
Milena Dinkova^a
Gea Schonewille^c
Anna van der Schors^c
Minou van der Werf^c

^a Utrecht School of Economics
Utrecht University

^b Faculty of Economics and Business
University of Groningen

^c Nationaal Instituut voor Budgetvoorlichting
(Nibud)

February 23, 2017

Abstract

In this paper, we report the results of a controlled field experiment designed to estimate the short-term effects of a 45-minute financial education program on financial literacy and savings behavior in Dutch primary schools. Among fifth and sixth graders, the program led to a pre- to posttest improvement in financial literacy on almost one out of eight questions, with about one-third of the increase in correctness attributable to the program. It also raised the savings probability for fifth graders by seven percentage point but generated no significant increase for sixth graders. Overall, the program appears to have been mainly effective for the questions explicitly addressed in its content. We also note that the significant program effects appear to be driven by the result for girls; however, we cannot reject homogeneous treatment effects with respect to gender.

Keywords: Education, treatment effects, panel data models.

JEL classification: A20, C21, C23

1. Introduction

Financial literacy, which measures how well individuals understand and use personal finance-related information (Huston 2010, p.306),¹ is crucial for dealing with every day finances. Even adolescents must make choices about cellphone contracts, student loans, debit card use, and clothing purchases, with several studies showing a relation between financial status in adolescence or young adulthood and financial problems later in life (Brown et al. 2016; Van der Schors and Stierman 2016). There is therefore little disagreement among policymakers that citizens need to be financially literate at a young age and that financial instruction should start in schools to educate individuals as early as possible (OECD 2006; APEC 2014). This viewpoint is supported in the psychological literature by evidence that (upper) primary school children are capable of understanding basic economic concepts and managing their money, and can thus be taught about personal finances (Otto et al. 2006; Webley 2005).

To identify groups of children that lack such skills, the OECD Program for International Student Assessment (PISA) tests financial literacy from the age of 15 (OECD 2014). The existence of such groups would imply a need for financial education programs even at young ages.

Nonetheless, little causal evidence exists on the effectiveness of financial education programs in improving financial literacy and behavior, prompting Lusardi and Mitchell (2014) to call for field experiments using formal treatment and control groups to identify which programs work and at what ages. According to an overview of controlled field experiments that measure the effectiveness of school-based financial education for improving financial literacy in secondary school children,² however, such programs can effectively improve *qualitative* financial

¹ Other definitions are given in Hung et al. (2009) or Remund (2010, p. 284).

² See also Mandell and Schmid Klein (2009) and the more general literature overviews in Alsemgeest (2015), Avery et al (2016), Fernandes et al. (2014), Lusardi et al. (2010), Lusardi and Mitchell (2014), McCormick (2009), and Willis (2008). Several of these studies discuss the need for and effectiveness of financial education.

knowledge and change behavior but are less effective in improving *quantitative* financial literacy skills (Avery et al. 2016). Yet a seminal study by Kourilsky (1977) provides evidence from primary schools in a U.S. metropolitan area that even children aged five and six can understand such economic concepts as cost-benefit analysis and scarcity. Likewise, Berti and Monaci (1998) demonstrate that Italian third graders are able to acquire and retain knowledge of how banks work after receiving instruction on this topic. More recent U.S. studies similarly document increased financial knowledge among fourth and fifth graders after participation in Oakland's Money Savvy Youth program (Go et al. 2012) and improved financial capabilities among Midwestern urban fourth graders following a financial education program that included access to a savings account (Sherraden et al. 2011). In certain Wisconsin schools, financial education for grades three to five increased student financial knowledge not only in the short term but also one year later while also appearing to raise savings probability (Batty et al. 2015). One Italian study, however, demonstrates a gender effect on savings behavior; that is, a program promoting saving's importance decreased impatience levels in boys but not in girls (Coda Moscarola and Migheli 2015).

Our contribution to this literature on financial education's effectiveness is threefold. First, our empirical evidence on primary school children in the Netherlands throws new light on whether the effectiveness demonstrated in U.S. field experiments is generalizable to Dutch primary schools. Second, our detailed analysis of pre-and posttest responses in relation to financial education program content provides valuable insights into what works and does not work for primary school children. Third, by allowing program effectiveness to vary by gender and grade, we improve understanding of both the gender gap in financial literacy (Bucher-Koenen et al. 2016) and the grades at which such programs best match the children's cognitive development (Scheinholtz et al. 2012; Webley 2005).

To estimate the effect of a financial education program on children's financial literacy and savings behavior, we analyze data from a controlled field experiment whose pre-and posttests were designed to measure these variables among fifth and sixth graders in Dutch primary schools. The experimental control group received a 45-minute financial education program (treatment), which although short was expected to make an impact. Assessment of its effectiveness is important because the program constitutes a real-life policy response by the financial sector to a government call for active involvement in children's financial education.³

We quantify the differences in financial literacy and savings behavior among these primary school children using the pre-treatment test results. Hence, the most closely related study is that of Van der Schors et al. (2016), who find increased financial literacy among participants in a primary school financial education program, offered for two years, that was virtually identical to the one studied here. We extend their work by using a controlled field experiment to evaluate the program, an important modification given that a pre-treatment test can influence post-treatment responses. To account for this effect, we use the responses of children in the control group that did not receive the 45-minutes of financial education.

The paper proceeds as follows. Section 2 describes the field experiment, section 3 presents the data, and section 4 outlines the empirical model. Section 5 then reports the estimation results, after which section 6 discusses the main findings and concludes the paper.

³ About 2,300 primary schools adopted this program (see section 2). An initial evaluation is reported in Schonewille et al. (2016), a report commissioned by the Dutch Banking Association (in Dutch).

2. Field experiment

Our field experiment was conducted in 2016 as part of Money Week, a yearly nationwide event in the Netherlands that focuses on financially educating children by providing all primary schools with thematic materials on a wide range of financial topics related to daily experience. After randomly generating an initial sample from among all Dutch primary schools, we then added in all the primary schools that had participated in the study by Van der Schors et al. (2016). This addition, together with a school-level response rate of about 14 percent, challenges the randomness of our sample. Caution is therefore warranted in extending our conclusions to the population of primary school children in the Netherlands. The primary schools were randomly assigned to *either* the control or treatment group, so that all children in the same school belong to the same one group.

During the week preceding Money Week and after about two to four weeks, respectively, children from both groups received pretest and posttest questionnaires (developed by Nibud⁴) that measured their financial literacy and savings behavior and collected their background characteristics. These questionnaires were administered by teachers to all the children in both groups, after which Nibud processed the resulting data. The treatment, administered during Money Week, was a 45-minute financial education program in the form of a Cash Quiz for which bank employees acted as quizmasters. The children at the control group schools did not play Cash Quiz.

In the third week of March, 2016, the Cash Quiz game, developed by the Dutch Banking Association (NVB) in cooperation with Nibud, was played at about one-third of primary schools in the Netherlands (about 120,000 children at 2,300 schools). This quiz covers four themes: (i) banks, money, and transactions, (ii) planning and managing, (iii) savings, borrowing, risk, and

⁴ The institute Nibud specializes in consumer behavior.

reward, and (iv) the financial landscape. The program content, which complies with the curriculum developed by the OECD International Network on Financial Education (OECD 2015a, OECD 2015b), is tailored toward fifth or sixth graders and gives the teacher a choice between two levels of difficulty (see Appendix A for the questions asked on all four quizzes). The quiz is played between groups of at most five children who can win virtual money for each question. Members of the group that wins most money receive plastic bracelets as prizes.

It is important to use a controlled experiment to measure the effects of the Cash Quiz on financial literacy and savings behavior as participation in the pretest or exposure to Money Week events, independent of having played the Cash Quiz, could affect posttest outcomes. That is, even if instructed to the teachers not to do so, the children may have learned from the pretest and discussed the questions and answers among themselves or with their teachers or parents. Likewise, Money Week, because of its high public profile and the various financial education materials it offers to schools and parents may have affected financial literacy.

3. The data

From the data set collected by Nibud (Schonewille et al. 2016), we exclude 195 children who took only the posttest (most from schools that only participated in the posttest) for whom we have none of the demographics elicited during the pretest. Our final sample thus encompasses 72 schools, 31 of which participated in both the pre- and posttest. As Table 1 shows, these schools produced a total of 3,773 completed questionnaires generated by the pre- and posttests of 2,321 children. Of the 1,452 children who completed the questionnaire for both the pre- and posttest, 454 are in the control group and 998 in the treatment group.

The top half of the table lists the percentages for the number of correct answers to all eight questions, with a mode of five (19.9 percent). On the pretest, the control group has more correct

answers on average than the treatment group, probably because the former contains relatively more sixth graders (bottom panel). However, children in both the control *and* treatment groups performed better on the posttest than on the pretest. On Q1, the children were more likely on the posttest than on the pretest to give the (arguably more desirable) answer of being willing to save for something they would like to buy but do not yet have the money for (middle panel).

As Table 1 also shows, control group children are more likely than treatment group members to be girls, and are on average older and more likely to receive pocket money. The youngest age category (age ≤ 10) includes 0.8 percent of children aged 9 (none younger than 9) and the oldest category (age ≥ 12) includes one percent of children aged 13 (none older than 13). It should be noted, however, that the differences in pre- versus posttest sample statistics on time-constant background variables are a result of the fact that not all children who did the pretest took the posttest.

Table 2 presents the wording of the eight financial literacy questions (Q2-Q9) and summarizes the results on the pre-and posttests. Pre- to posttest improvements are observed on each item for both the control and treatment groups. On average, the children performed best in the pretest on the question most closely related to their daily lives; namely, Q4 on advertisements in free online games and relatively small pre- to posttest improvements on this question are observed for both the control and treatment groups. They performed worst on Q6, keeping a budget diary, a concept likely to be unfamiliar to young children. Interestingly, the largest pre- to posttest improvements are observed on this question for both the control and treatment groups. The concept of a budget diary is content of all four quiz versions (CQ4 in Appendix A) and two other Cash Quiz questions directly addressed pre- and posttest content as well (see Appendix A for an overview): the concept of debt (Q3 in Table 2; CQ12 in Appendix A), introduced in both fifth-grade versions, and the pay-to-win principle (Q5 Table 2) covered by the sixth-grade quiz (CQ8 in Appendix A). Nonetheless, certain other Cash Quiz questions are indirectly related to

pre- and posttest questions. For example, the question on purchasing balls for a sports club (Q8) involves a comparison of offers but in a different context to that on the tests. Likewise, all four versions of the Cash Quiz contain a numeracy question that requires calculation of the time needed to save for something (CQ10 in Appendix A), which is indirectly related to the question on savings (Q1 in Table 1).

4. Empirical Models

In our empirical models, the dependent variable is the number of correct responses to eight of the financial literacy questions (Q2–Q9) or, whether or not a correct answer is given when analyzing each of the nine questionnaire items (Q1–Q9) separately (a linear probability model). For these models, the outcome variable is Y_{it} , with indices i and t designating the child and time of the pre- ($t=0$) and posttest ($t=1$), respectively, and X_{it} is a set of explanatory variables. All models are estimated by least squares and standard errors are clustered by school.

Model (1), which is estimated using only pretest responses ($t=0$), identifies how financial literacy and savings behavior are associated with background characteristics, including gender, age, grade, and whether or not the child receives pocket money, does chores for money, or is interested in money matters:

$$(1) Y_{i0} = \alpha_0 + X_{i0}^T \alpha + \eta_{i0}, \quad i \in \{1, \dots, n\},$$

where η_{i0} is an error term.

Model (2) is then estimated using the sample of children who completed both the pre- and posttests with background characteristics omitted because they remain constant over time and are controlled for by including a child-specific fixed effect α_i :

$$(2) Y_{it} = \alpha_i + \theta_1 t + \theta_2 \text{Treatment}_i + \beta \text{Treatment}_i \times t + \varepsilon_{it}, \quad i \in \{1, \dots, n\} \text{ and } t \in \{0, 1\},$$

where θ_2 is the mean difference in Y_{it} between control and treatment groups in the pretest, and ϵ_{it} is an error term. *Treatment* equals one if child i participated in the Cash Quiz (treatment group) and zero otherwise (control group). The treatment effect β is the mean difference in Y_{it} between the pre- and posttest in the treatment group minus the mean difference in Y_{it} between the pre- and posttest for the control group (θ_1). This latter only holds, however, under the necessary model assumption of a common trend; that is, in the absence of treatment (but controlling for child-specific fixed effects), the mean difference between pre- and posttest Y_{it} would be the same for the treatment and control groups (Angrist and Pischke 2009).

In Model (3), we eliminate fixed effects by taking first differences, so the estimator of β is a difference-in-difference estimator (Angrist and Pischke 2009):

$$(3) \Delta Y_i = \theta_1 + \beta \text{Treatment}_i + \Delta \epsilon_i, \quad i \in \{1, \dots, n\}.$$

Here, the treatment effect β represents the causal impact of the financial education program (Cash Quiz) on financial literacy or on the savings decision, formally expressed as

$$(4) \beta = E(Y_{i1} - Y_{i0} | \text{Treatment}_i = 1) - E(Y_{i1} - Y_{i0} | \text{Treatment}_i = 0).$$

We can then estimate the heterogeneous treatment effects as follows:

$$(5) \Delta Y_i = \sum_{j=1}^J \gamma_1^j G_i^j + \sum_{j=1}^J \gamma_2^j G_i^j \times \text{Treatment}_i + \Delta u_i, \quad i \in \{1, \dots, n\} \text{ and } j \in \{1, \dots, J\}.$$

where G_i^j is a dummy variable equal to one if child i belongs to group j and zero otherwise, J is the number of groups, Δu_i is the first-differenced error term, and γ_1^j and γ_2^j are a group-specific common time trend and the treatment effect for children in group j , respectively. In the empirical analysis, these groups are defined based on gender and grade. We test for homogeneous treatment effects using the null hypothesis $H_0: \gamma_1^1 = \gamma_1^2 = \gamma_1^3 = \gamma_1^4$.

5. Empirical results

First, using the pretest sample, we test for endogenous selection into either the treatment and control groups or the panel.⁵ In the discussion of our empirical findings we draw conclusions based on a five percent level of significance for statistical tests. As the penultimate column of Table 3 shows, the null hypothesis of exogenous selection is not rejected for any questions except Q9, level of interest.⁶ Removing Q9 from our analysis, however, does not change any of the main findings, so we retain it in subsequent regressions. The results in the last column show that exogenous selection into the panel is not rejected for each of the financial literacy questions which suggests that our results can be validly interpreted without conditioning on both tests having been taken.

5.1 Associations of financial literacy with background characteristics

Equation (1) estimates the determinants of financial literacy based only on the pretest responses. The results, shown in Table 3, provide more evidence for the gender gap documented for (Dutch) adults by Bucher-Koenen et al. (2016): on average, the girls give fewer correct answers than the boys. Our control for level of interest in money matters, however, rules out the explanation that girls are less interested in money matters than boys. Rather, this phenomenon may be attributable to girls being less confident, as suggested by the Bucher-Koenen et al. (2016) finding that women are more likely than men to answer “Don’t know.” In fact, this latter observation is confirmed by our Table 1 (cf. Van der Schors et al. 2016). When we break down the number of correct answers by question (Table 3), girls are less likely to

⁵ Following Nijman and Verbeek (1992), we add dummy variables into equation (1) for whether or not the child is in the panel and whether or not in the treatment group.

⁶ In unreported results, all else being equal, treatment group children have a five percentage point lower probability of answering the interest rate question correctly.

answer five out of the eight questions correctly. The largest gender gap is for the financial numeracy question on which offer to choose when purchasing balls for a sports club (Q8).

The associations between financial literacy and age, on the other hand, should be interpreted cautiously because this present study controls for grade.⁷ In separate unreported analyses without this latter control, older children did better on average than younger children.

A greater number of correct answers is positively associated with receiving pocket money, which the responses may suggest financially empowers children. In particular, pocket money recipients were more likely to correctly answers questions related to a bank balance (Q2), loan repayment (Q3), budget diary (Q6), and offers for the sports club ball purchases (Q8). We find no evidence, however, that doing chores for money is associated with higher financial literacy. In fact, being interested in money is associated with fewer correct responses overall, although no significant associations emerged for individual questions.

5.2 Cash Quiz evaluation

The top row of the first column of Table 4 shows that children from both the control and treatment groups improved their financial literacy between the pre- and posttest. The estimated trend coefficient shows an average improvement on about 0.60 out of eight questions and the estimated treatment coefficient shows that the program led to an additional average pre- to posttest improvement in financial literacy on 0.32 out of eight questions. Hence, about one-third of the improvement between the pre- and posttest is attributable to the Cash Quiz. In particular, the improvement attributable to the Cash Quiz is observable for Q5, free online games, a question conceptually related to the sixth-grade Cash Quiz item on pay-to-win, which may explain the 9 percentage point increase in correct answers (first column). The largest

⁷ Removing children aged 13 from the sample, i.e. children who should already have been in secondary school and appear to have fallen behind in their educational development, turns the age associations insignificant.

improvement attributable to the Cash Quiz is 13 percentage point with Q6, keeping a budget diary, and this may be explained by the keeping of a budget diary being also content of all four Cash Quiz versions.

About two-thirds of the improvement between the pre- and posttest is attributable to a common trend. The first column shows significant and strong common trend effects for half of the questions, with Q6, keeping a budget diary, having the largest. These findings imply a large impact of either having done the pretest or of Money Week events and demonstrate the importance of having a control group in our field experiment.

5.3 Heterogeneous treatment effects

The heterogeneous treatment effects with respect to gender and grade are estimated using equation (5) and reported in Table 4. The first row of this table shows that we only find a positive and significant treatment effect for girls in the sixth grade. The rows on each question show that the improvement for these female sixth graders is particularly significant for Q5, free online games, and Q6, keeping a budget diary, which are related to the content of the Cash Quiz. Girls in the fifth grade also showed improvement on Q3, loan repayment, a part of the fifth-grade Cash Quiz. These significant gender-based improvements on Q3 and Q5 suggest that girls learned more from the Cash Quiz than boys. On the other hand, the only group that did not show improvement on Q6, keeping a budget diary, were fifth grade girls. It should be noted, however, that homogeneous treatment effects could not be rejected for any question except Q3 (Table 4, last column), so although gender differences do appear to exist, they are not statistically significant.

5.4 Robustness checks

Because the Cash Quiz has four levels, we recognize these different versions of the quiz may have influenced the treatment effects as they raised somewhat different financial issues

between the pre- and posttests (see Appendix A). In addition, according to the teachers of about 70 percent of the classes (containing 1,008 children, with 48 percent in grade six),⁸ in-class content between the pre-and posttests included for about 14 percent of children a discussion of the pretest they had taken and for about 71 percent of children the use of the (non-Cash Quiz) materials offered to primary schools during Money Week. In the treatment group, 66 percent of fifth graders and 38 percent of sixth graders did the relatively easier version of the Cash Quiz (Version B, Appendix A). We therefore perform a robustness check on the results listed in Table 4 by incorporating into equation (3) controls for whether the pretest was discussed in class, whether (other) financial themes were discussed in class, and for the four levels of the Cash Quiz.

As the first four columns of Table 5 show, the treatment effects without these controls are similar to those in Table 4 except for a significant improvement in Q5 for fifth grade girls but no significant improvement in Q3 for this smaller sample. The last four columns of Table 5 show that incorporating these additional control variables makes little difference to correctness levels, meaning that the treatment effects were not significantly affected by the in-class discussion, the use of other Money Week material, and the different levels of the Cash quiz.

5.5 Effect of the Cash Quiz on Don't Know Responses

As Table 1 shows, girls were more likely to answer “Don’t know” (DK) than boys and this could be attributable to lack of confidence (see Bucher-Koenen et al. 2016). The observation in Table 4 that financial literacy was improved on average more for girls than for boys by participation in the Cash Quiz, therefore, raises the additional question of whether this observation is

⁸ As the numbers show, not all teachers filled in a questionnaire after the posttest. Unreported test results for endogenous sample selection from this source of non-response suggest that only Q2 might be problematic, so the Q2 outcomes should be interpreted with caution.

attributable to increased confidence. Yet, as Table 6 shows, three of the four significant effects on the probability of answering DK are for boys versus one for girls. Combining the results for all questions together (first row of the table) produces no significant outcomes. Hence, these findings, taken together, may suggest that increased confidence is not part of the explanation for girls appearing to learn more from the Cash Quiz than boys.

5.6 Savings behavior and financial literacy

Whereas the pre-and posttest question on savings (Q1) is behavioral, the other questions (Q2-Q9) address financial literacy. In the financial literacy literature, responses to such items as financial numeracy questions are often related to savings behavior because financial literacy might be a tool for policymakers to improve savings decisions. In our study, the probability of saving for a desired product is positively associated with receiving pocket money (Table 7, columns (1) & (2)), which is contrary to Brown and Taylor's (2016) association of pocket money with a lower savings probability. Nonetheless, like Brown and Taylor (2016), we identify a link between doing chores for money and a higher probability of saving. Savings probability is also positively associated with the financial numeracy questions (Q8 and Q9), whose coefficients are individually significant at the 10 percent level (column (2), bottom). Lastly, savings probability appears to be affected by the Cash Quiz treatment even after financial literacy is controlled for (columns (3) & (4)) although it remains seemingly unaffected by the literacy itself as the joint significance tests at the bottom of the table show. This effect of the Cash Quiz treatment on the probability of saving, however, is only significant for fifth graders (Table 8), a finding that remains unchanged in additional (unreported) regressions even after controls for pocket money and doing chores are added into equation (5).

6. Conclusions

By estimating the short-term effects of the Cash Quiz financial education program on financial literacy and savings behavior among fifth and sixth graders in Dutch primary schools, we show that the quiz improves fifth graders' willingness to save for a desired product but has no such effect on sixth graders. Although our finding echoes that of Go et al. (2012) and Sherraden et al. (2011) for the U.S., neither of these studies examines sixth graders, and we are unable to explain the grade difference. Based on our Table 6 results, however, we can exclude the possibility that sixth graders start from a higher initial level.

We also demonstrate that approximately one-third of the pre- to posttest improvement in financial literacy is attributable to Cash Quiz questions that explicitly deal with the financial aspects tested. This finding supports the effectiveness of facilitating learning by directing children's attention to specific topics; in our case, for instance, the keeping of a budget diary. The children show no improvement, however, on financial literacy issues either not dealt with during the program or presented in a different context, such as choosing best offers when purchasing balls for a sport club (Q8).⁹ These findings may suggest that the cognitive development of most children in our study is as such that they are not yet able to reason beyond concrete examples (Scheinholtz et al. 2012). Lastly, although our tests for treatment heterogeneity suggest that the Cash Quiz is more effective for girls than for boys, the test statistics indicate no significant gender differences in the treatment effects for seven of the eight financial literacy questions.

A more critical assessment of the above might query whether the Cash Quiz's limited impact (i.e., on only those financial literacy aspects explicitly dealt with in the program) raises doubts on

⁹ One possible explanation, to be investigated in future research, is that this finding is related to the use of percentages in the answer to Q10.

the appropriateness of the way in which we evaluate financial education's effectiveness. It may be, for example, that financial literacy is more about the motivation to acquire than about the financial education goal of increased knowledge on specific financial topics (Caskey 2006). In particular because, as mentioned, the cognitive development of most primary school children may be as such that one can only measure in the short run the effect of concrete examples (Scheinholtz et al. 2012). Hence, in light of the suggested link between financial education and improved student attitudes toward money issues and the role of motivation and attitude as important drivers of informed financial decisions (Batty et al. 2015), future research might consider evaluating financial education programs like the Cash Quiz by measuring changes in the psychological factors related to financial empowerment.

Acknowledgments

We are grateful to the Dutch Banking Association for their financial support and would like to thank seminar participants at Collegio Carlo Alberto; the Munich Center for the Economics of Aging; the Ludwig Maximilian University of Munich; Nibud; and the University of Utrecht School of Economics for valuable comments and suggestions.

References

- Alsemgeest, L., 2015, Arguments for and against financial literacy education: Where to go from here?, *International Journal of Consumer Studies*, 39(2), 155-161.
- Angrist, J.D. and Pischke, J-S., 2009. *Mostly harmless econometrics*, Princeton University Press, New Jersey.
- APEC, 2014, *Guidebook on financial and economic literacy in basic education*, Human Resources Development Working Group, APEC no. 214-HR-03.1.
- Avery, M., de Bassa Scheresberg, C., and Guiso, F., 2016, Understanding what works: Case studies in financial education, report, Global Financial Literacy Excellence Center.

- Batty, M., Collins, M.J., and Odders-White, E., 2015. Experimental evidence on the effects of financial education on elementary school students' knowledge, behavior, and attitudes, *Journal of Consumer Affairs* 49(1), 69-96.
- Berti, A.E., and Monaci, M.G., 1998. Third graders' acquisition of knowledge of banking: Restructuring or accretion?, *British Journal of Educational Psychology*, 68, 357-371.
- Brown, M., Grigsby, J., van der Klaauw, W., Wen, J., and Zafar, B., 2016, Financial education and the debt behavior of the young, *Review of Financial Studies*, forthcoming.
- Brown, S., and Taylor, K., 2016. Early influences on saving behaviour: Analysis of British panel data, *Journal of Banking and Finance*, 62, 1-14.
- Bucher-Koenen, T., Alessie, R., Lusardi, A., and Van Rooij, M., 2016, Women, confidence, and financial literacy, Mimeo.
- Caskey, J., 2006. *Can personal financial management education promote asset accumulation by the poor?*, Networks Financial Institute Policy Brief No. 2006-PB-03.
- Coda Moscarola, F., and Migheli, M., 2015. Gender differences in financial education: Evidence from primary school, working paper, Centre for Research on Pensions and Welfare Policies (CeRP), Collegio Carlo Alberto, Torino.
- Fernandes, D., Lynch Jr., J.G., and Netemeyer, R.G., 2014. Financial literacy, financial education, and downstream financial behaviors, *Management Science*, 60(8), 1861-1883.
- Go, C.G., Varcoe, K., Eng, T., Pho, W., and Choi, L., 2012. Money savvy youth: Evaluating the effectiveness of financial education for fourth and fifth graders, FRBSF Working Paper No. 2012-02, Federal Reserve Bank of San Francisco, San Francisco.
- Hung, A.A., Parker, A.M. and Yoong, J.K., 2009. Defining and measuring financial literacy, Rand Working Paper No. WR-708.
- Huston, S.J., 2010. Measuring financial literacy, *Journal of Consumer Affairs*, 44(2), 296-316.
- Kourilsky, M., 1977. The kinder-economy: A case study of kindergarten pupils' acquisition of economic concepts, *Elementary School Journal*, 77(3), 182-191.
- Lusardi, A., and Mitchell, O., 2014. The economic importance of financial literacy: Theory and evidence, *Journal of Economic Literature*, 52(1), 5-44.
- Lusardi, A., Mitchell, O., and Curto, V., 2010. Financial literacy among the young, *Journal of Consumer Affairs*, 44(2), 358-380.
- Mandell, L., and Schmid Klein, L., 2009. The Impact of financial literacy education on subsequent financial behavior, *Journal of Financial Counseling and Planning*, 20(1), 15-24.
- McCormick, M. H., 2009. The effectiveness of youth financial education: A review of the literature, *Journal of Financial Counseling and Planning*, 20(1), 70-83.
- Nijman, T. E., and Verbeek, M. J. C. M., 1992. Non-response in panel data: The impact on estimates of a life cycle consumption function, *Journal of Applied Econometrics*, 7(3), 243-257.
- OECD, 2006. The importance of financial education, OECD Policy Brief, www.oecd.org/finance/

financial-education/37087833.pdf

OECD, 2014. PISA 2012 Results: *Students and Money: Financial Literacy Skills for the 21st Century* (vol. 6), Program for International Student Assessment, <http://dx.doi.org/10.1787/9789264208094-en>).

OECD, 2015a. *Toolkit for measuring financial literacy and financial inclusion*, OECD International Network on Financial Education (INFE).

OECD, 2015b. National strategies for financial education, *OECD/INFE policy handbook*.

Otto, A.M.C., Schots, P.A.M., Westerman, J.A.J., and Webley, P., 2006. Children's use of saving strategies: An experimental approach, *Journal of Economic Psychology*, 27, 57-72.

Remund, D. L., 2010. Financial literacy explicated: The case for a clearer definition in an increasingly complex economy, *Journal of Consumer Affairs*, 44(2), 276-295.

Scheinhloltz, L., Holden, K., and Kalish, C., 2012. Cognitive development and children's understanding of personal finance, in D.J.Lamden (ed.), *Consumer knowledge and financial decisions* (pp. 29-47), Springer-Verlag, New York.

Schonewille, G., van der Werf, M., and van der Schors, A., 2016. Het effect van de Cash Quiz tijdens de week van het geld [The effect of the Cash Quiz during Money Week], National Institute for Budget Information (Nibud), Utrecht.

Sherraden, S.M., Johnson, L., Guo, B., and Elliot, III, W., 2011. Financial capabilities in children: Effects of participation in a school-based financial education and savings program, *Journal of Family Economics Issues*, 32, 385-399.

Van der Schors, A., Madern, T., Alessie, R., and van der Werf, M., 2016. Financial literacy of Dutch children: Does education matter?, Mimeo

Van der Schors, A., and Stierman, N., 2016. Financiële opvoeding & het financiële gedrag als volwassene [Financial education and financial behavior as an adult], report, National Institute for Budget Information (Nibud), Utrecht.

Webley P. (2005). Children's understanding of Economics. In M. Barrett & E. Buchanan-Barrow (Eds). *Children's understanding of Society* (pp. 43-67). Hove: Psychology Press

Willis, L., 2008. Against financial literacy education, Penn Law Paper No. 208, University of Pennsylvania Law School, Philadelphia.

Appendix A Cash Quiz questions (four versions)

A1. Banks, money & transactions			
Grade 5		Grade 6	
Version B	Version A	Version B	Version A
A bank is a business that needs to earn money to remain open.		You saved €80. A part of it you put in your savings account.	
Which statement is correct?	How does a bank earn money?	What does a bank do with the money in savings accounts of its customers?	What does a bank do with the money in savings accounts of its customers?
1. A bank earns money buy selling things such as bankcards.		1. The bank keeps the money in a vault until the customer comes to collect it.	
2. A bank earns money by playing the national lottery		2. The bank gives the money to the government so it can govern the country.	
3. A bank earns money by lending it and asking for interest in return.		3. The bank loans the money to other people or business	
You saved about 80 euros. You would like to put the money into a bank account		Banknotes are printed in money factories.	Wealth is unfairly distributed: some people have a lot of money, other too little.
You do not know yet what to do with the money. You like sometimes to buy things.		Who decides how many banknotes can be printed?	
Why is it better to put your money into an current account than a savings account?	Is it better to open a savings account than a current account?	1. The bank can decide on its own.	Why can money factories not print more money so everyone who has too little can have more?
1. If the money is in a current account, it is easier to get when you would like to buy something.		2. That is decided my the prime-minister.	1. Because money looses value if too much is printen.
2. If the money is in a current account, you receive more interest.		3. That is decided by the European Central Bank.	2. Because everyone will have enough money and nobody want to work anymore.
3. If the money is in a current account, you have to spend it.			3. Because rich people do not want poor people to become also rich.
On one side of a euro coin the value of the coin is printed.	Which country does not have the euro as its currency?	Why is a trouser from the new collection more expensive than a trouser from a collection of three years ago?	Why is the price of the same bottle of soda higher in a restaurant than in the supermarket?
What is on the other side?	1. Germany		
1. A symbol of one of the euro countries.	2. Greece	(people like clothing that is in fashion, and shops know this)	(you also pay for the service/ambiance)
2. The map of Europe.	3. England		
3. A picture of the European parlement.			

A2.Planning & managing			
Grade 5		Grade 6	
Version B	Version A	Version B	Version A
Kris has a budget diary. For income he writes down how much money he receives		Ryan has a budget diary. For income he writes down how much money he receives	
and for expenditures how much money he spends.		and for expenditures how much money he spends. Look at the table (showcard).	
(A show card) Which words have to be filled in for the letters (A, B, C)	(A show card) How does Kris calculate how much money he has?	Ryan sees that his income is higher than his expenditures. What does that mean?	Ryan calculates how much money he has. How does he do that? (Showcard)
1. A: expenditures, B: income, C: total	1. He subtracts the expenditures from income: €6.70-€2.80	1. Ryan is short of money.	(He subtracts the expenditures €5.65 from income €4.20 = €1.45.)
2. A: income, B: total, C: expenditures	2. He subtracts income from expenditures: €2.80-€6.70	2. Ryan has money to spare.	
3. A: income, B: expenditures, C: total	3. He adds income and expenditures: €6.70+€2.80	3. Ryan receives has as much money as he spends.	
You are watching a talentshow on television. Your favorite candidate needs votes from viewers to go to the next round.		Alicia goes into town to buy clothes. She is in a shopping mood! But she cannot spend more than €100. Her father doubts: shall he give Alicia the money in cash	
You vote on your favorite candidate using a text-message. What does it cost?	How does the broadcast station earn money with the talentshow?	or shall he transfer the money into her account and she can use her debit card?	
1. Nothing	(correct answers are: advertisement, text messages, merchandising)	He decides to give the money in cash to her.	Alicia and her father are thinking about the pros and cons of a debit card.
2. Less than €0.30		Why does Alicia's father not let her use her debit card?	
3. €0.80 or more		1. Alicia is only 12 years old and children of 12 are not allowed to use a debit card.	What is an important advantage and an important disadvantage of a debit card in the situation of Alicia?
		2. The father is afraid that Alicia will see so many nice clothes that she will spend more than €100.	
		3. It is safer to walk on the street with cash than with a debit	
Who earns most money?	Why does the manager of a supermarket earn more than the cashier?	What is another word for the amount that is in a bank account?	From which age can you have a side job such as distributing advertising brochures?
1. A cashier at the supermarket	1. Because the manager is more clever	1. Balance	(from the age of 13)
2. A restocker at the supermarket	2. Because the manager is a man	2. Giro	
3. The manager (boss) of the supermarket	3. Because the manager has more responsibilities	3. IBAN	

A3. Savings, borrowing, risk & reward			
Grade 5		Grade 6	
Version B	Version A	Version B	Version A
The supermarket has different sorts of chocolate sprinkles.	The supermarket has chocolate sprinkles in different packages.	When is it not smart to make use of the special offer "buy two, get one free"?	Is it always smart to make use of the special offer "buy two, get one free"?
Some packages are boring and others have nice games at the back.	Some packages are boring and others have nice games at the back.	1. When you need only one product.	(no, depends on how many products you need)
One of the packages has a photo of your favorite moviestar.	Why are there sometimes nice games at the back of a package	2. When you need two products.	
What do you do when you would like to spend your money wisely?	of chocolate sprinkles? (They hope to sell more if the package is attractive.)	3. When you need three products.	
1. You buy the biggest package			
2. You buy the most fun package			
3. You buy the cheapest package			
Computer games are on sale. At shop A the games of €18 are now half price.	Your favorite action figures are on sale! At shop A all figures of €6.50	You play a free online game. Just when you are getting good at it, you cannot	Kay downloads a game on his cell phone. It appears to be a free game.
At shop B you pay €19 for two games. And at shop C all games are today €8.	are half price. At shop B you pay for three figures €12. And in shop C	continue. You can only continue when you buy points by sending a text message.	But when Kay starts playing it turns out to be a pay-to-win game.
In which shop are the games cheapest?	a figure costs €6.15 but has a special offer of three for the price of two.	What is the wise thing to do?	What is a pay-to-win game?
(shop C)	In which shop are action figures cheapest?	1. You send a text message.	1. A game for which you have to pay when you download it.
	(shop A)	2. You stop playing.	2. A game for which you can buy attributes such as access to a higher level. You pay with real money.
		3. You ask your parents for advice.	3. A game in which you have to pay real money to your adversary to be able to win.
You buy a mobile phone. What more do you need to buy before you can make calls?	A specific book is on the internet two euros cheaper than in the store.	You would like to buy a new cell phone. On the internet are two attractive offers.	You would like to buy a new cell phone. You can choose between several offers.
	You order the book on the internet. But when you want to pay	1. A free cell phone and a two-year subscription for €29 per month.	1. A free cell phone and a two-year subscription for €35 per month.
(a subscription or prepaid card)	the book costs more than in the store. How is that possible?	2. A cell phone for €100 and a two-year subscription for €23 per month.	2. A cell phone for €100 and a two-year subscription for €23 per month.
	(shipping costs)	What is the best offer?	per month. You can extend this subscription for one more year.
		(offer 2)	What is the best offer? (offer 3)

A4. Financial landscape			
Grade 5		Grade 6	
Version B	Version A	Version B	Version A
Milou would like to buy beads of €30 to make her own jewelry.	Milou would like to buy beads of €30 to make her own jewelry.	Job saves for a game computer of €260. His mother pays a quarter of the amount.	Job saves for a game computer of €260. His mother pays a quarter of the amount.
She saved already €18.50. She receives €2.50 pocket money per week.	In her piggybag she has three notes of €5, two coins of €2, and six coins of €0.20. She receives	In his bank account he has €177. Job gets €4.50 pocketmoney per week.	In his bank account he has €177. At the end of each month he gets €20 pocketmoney. Of that he also pays
In how many weeks can Milou buy the beads?	€2.50 pocket money per week.	In how many weeks can Job buy his game computer?	his monthly cell phone subscription of €8.
<i>(in 5 weeks)</i>	In how many weeks can Milou buy the beads? <i>(in 4 weeks)</i>	<i>(In 4 weeks)</i>	In how many months can Job buy his game computer? <i>(In 2 months)</i>
You play with a tablet of a friend. In a clumsy moment you drop it on the floor.	You are skateboarding on a bicycle lane. You forgot to pay attention and	Your friend goes into town. You cannot join her but you would like to buy a new	You receive an email with the request for your bank account number, pin and
The tablet is broken.	hit a biker who falls. Luckily there are no injuries but the bike is damages.	book. You do not have cash at hand. In your account there is a large sum of money.	other personal information. The email appears to be from your bank.
Who has to pay for the damages?	The accident was your fault. Who has to pay for the repairs of the bike?	What is the wise thing to do?	What is the wise thing to do?
1. You	1. The biker	1. Give you debit card to your friend so she can buy the book for you.	1. Reply to the email and provide all requested information.
2. Your parents	2. You	2. At a later stage, go to the bookstore yourself so you can buy the book.	2. Not to reply to the email and show it to your parents.
3. Your friend or his parents	3. Your parents	3. Ask your friend to buy the book for you and pay her the amount back later.	3. Delete the email and don't tell anyone about it.
When do you have debts?	If you have debts, then you have	To borrow money from the bank costs money. Is that true?	What is the money called that the bank puts in your bank account?
1. When you buy something that you only need to pay for in a year's time.	1. borrowed money and paid it back	Please motivate your answer.	1. Interest.
2. When you borrow money of someone	2. borrowed money but not yet got it back		2. Deposit.
3. Both 1 and 2	3. borrowed money but not yet paid it back		3. Fee.

Table 1: Descriptive statistics

Number of correct answers, Q2-Q9 (row percentages)											
	None	1	2	3	4	5	6	7	All eight	row-sum	Number of children
All groups and times	0.8	2.6	7.5	13.3	17.0	19.9	18.3	13.5	7.2	100.0	3773
Control group, pretest	1.3	3.6	7.3	13.5	18.2	20.5	17.0	12.6	6.1	100.0	777
Control group, posttest	0.2	1.1	2.9	12.6	15.0	18.4	22.0	17.7	10.1	100.0	446
Treatment group, pretest	1.1	3.5	10.6	16.1	18.6	20.0	16.7	9.3	4.2	100.0	1544
Treatment group, posttest	0.1	1.1	4.8	9.0	14.5	20.2	20.3	18.9	11.2	100.0	1006
Savings behavior (row percentages)											
Q1: You would like to buy something nice but do not have the money for it. What would you do?	Buy something less nice	Save for it	Ask parents	Don't know	row-sum						
All groups and times		1.1	89.9	6.6	2.5	100.0					
Control group, pretest		1.4	90.9	5.5	2.2	100.0					
Control group, posttest		0.7	90.4	6.1	2.9	100.0					
Treatment group, pretest		1.2	88.0	7.8	2.9	100.0					
Treatment group, posttest		0.9	91.7	5.6	1.9	100.0					
Explanatory Variables	Girls	Age ≤ 10	Age 11	Age ≥ 12	Grade 6	Receives pocket money	Chores for money	Interest in money matters		Number of "Don't know" answers Q2-Q9 boys	Number of "Don't know" answers Q2-Q9 girls
	%	%	%	%	%	%	%	%		Mean	Mean
All groups and times	50.6	31.4	47.5	21.1	46.0	76.0	61.0	23.6		1.2	1.4
Control group, pretest	52.5	29.1	48.9	22.0	52.8	80.3	60.7	22.1		1.4	1.5
Control group, posttest	52.2	30.5	49.6	20.0	52.5	80.9	60.5	19.7		1.0	1.0
Treatment group, pretest	49.7	32.3	47.5	20.3	42.0	73.1	61.3	24.6		1.4	1.8
Treatment group, posttest	49.9	32.1	45.6	22.3	44.0	75.0	61.1	25.0		0.8	1.0
Notes : The pre- and posttest questions Q2-Q9 are formulated in Table 2. Children who did the posttest also did the pretest.											
Age is at the time of the pretest and the questions related to pocket money, chores and interest in money matters are only asked during the pretest.											
Q1 answer categories are (i) I buy something less nice or which I now have the money (ii) I save money so I can buy it later (iii) I ask money to my parents or someone else. (iv) I don't know.											

Table 2 Pre- and posttest responses

Questions and statements (correct answers in Italic)	Control group, pretest	Control group, posttest	Control group, change	Treatment group, pretest	Treatment group, posttest	Treatment group, change
	%	%	%-point	%	%	%-points
Q2. How do you call the amount that you see when you open your bank account on a computer or a bank-app? (i) <i>IDEAL</i> (ii) <i>Balance</i> (ii) <i>IBAN</i> (ii) <i>Giro</i> (ii) I don't know	42.3	45.7	3.4	42.1	52.0	9.9
Q3. What is true? Jan borrows money from a bank: (i) Jan has to pay the money he borrowed back (ii) <i>Jan has to pay the money he borrowed back and he has to pay extra money (interest)</i> (iii) Jan has to pay a part of the money back. (iv) Jan does not need to do anything. (v) I don't know	63.2	72.0	8.8	58.5	71.7	13.2
Q4. Advertisement is forbidden in free online games. (i) <i>True</i> (ii) <i>False</i> (iii) I don't know	87.1	91.0	3.9	84.4	89.2	4.8
Q5. If you play free online games it could be possible you have to pay money. (i) <i>True</i> (ii) <i>False</i> (iii) I don't know	57.0	63.0	6.0	58.0	71.9	13.8
Q6. What is a budget diary? (i) <i>A book in which you write down all your income and daily expenses</i> (ii) A book in which you keep all important papers (iii) A book in which you keep all your bills, to make it possible to pay then at once at the end of the month (iv) I don't know	30.4	47.3	16.9	26.4	58.3	31.9
Q7. What is the minimum number of euro coins needed to pay €1.25 without needing any change? (i) 2 coins (ii) <i>3 coins</i> (iii) 4 coins (iv) 5 coins (v) I don't know	68.1	78.9	10.8	62.4	75.8	13.5
Q8. Your sportclub needs 20 new balls. Which special offering is cheapest? (i) <i>One ball costs €20 and each fifth ball is for free</i> (ii) One ball costs €20 and you get a 10% discount (iii) I don't know	56.1	64.3	8.2	54.9	59.3	4.4
Q9. Suppose Minou has €100 euro in her savings account. The interest rate is 2% per year. She leaves the money in her account for five years. In the meantime she does not withdraw money. How much will she have in her savings account after five years? (i) <i>More than €102.-</i> (ii) Exactly €102.- (iii) Less than €102.- (iv) I don't know	68.1	70.9	2.8	59.1	61.9	2.8
Notes: For most questions the answers categories were in reverse order at the posttest.						
Q7: uses €2.70 in the posttest and Q9 uses an interest rate of 3% interest rate and an amount of 103 in the posttest.						

Table 3: Estimations of financial literacy determinants and tests results for endogenous selection into the control or treatment group or panel (based on the 2,321 pretest responses only)

Model: Equation (1)		Girl	Age≤10	Age≥12	Grade 6	Receives pocket money	Does chores for money	Interest in money matters	Constant	Endogenous selection into treatment group H0: no selection (p-value)	Panel attrition selection H0: no selection (p-value)	R2
Number of correct answers	p.e.	-0.36	0.09	-0.32	1.35	0.41	0.11	-0.20	3.82	0.34	0.83	0.13
	s.e.	(0.07)	(0.09)	(0.10)	(0.13)	(0.10)	(0.08)	(0.09)	(0.13)			
Q2 Bank balance	p.e.	-0.08	0.04	0.01	0.17	0.09	0.04	-0.04	0.28	0.33	0.76	0.04
	s.e.	(0.02)	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)	(0.03)	(0.04)			
Q3 Loan repayment	p.e.	-0.09	-0.01	-0.08	0.21	0.07	-0.02	-0.03	0.54	0.35	0.91	0.05
	s.e.	(0.02)	(0.03)	(0.02)	(0.03)	(0.03)	(0.02)	(0.02)	(0.04)			
Q4 Advertisement in free online games	p.e.	0.01	0.05	0.00	0.07	0.00	0.00	-0.03	0.81	0.11	0.17	0.01
	s.e.	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)	(0.03)			
Q5 Free online game, always for free?	p.e.	-0.06	-0.04	-0.06	0.09	0.06	0.04	-0.04	0.53	0.35	0.54	0.02
	s.e.	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)	(0.04)			
Q6 Budget diary	p.e.	0.01	0.01	0.02	0.14	0.05	0.02	-0.01	0.16	0.33	0.92	0.03
	s.e.	(0.02)	(0.02)	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)	(0.03)			
Q7 Euro coins	p.e.	0.04	0.00	-0.08	0.21	0.05	0.01	0.02	0.50	0.28	0.97	0.04
	s.e.	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)	(0.03)			
Q8 Balls for sportclub	p.e.	-0.12	0.02	-0.07	0.18	0.06	0.02	-0.03	0.49	0.82	1.00	0.04
	s.e.	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)	(0.03)			
Q9 Interest rate	p.e.	-0.07	0.02	-0.06	0.27	0.03	-0.01	-0.04	0.53	0.03	0.72	0.07
	s.e.	(0.02)	(0.02)	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)	(0.03)			
Notes : p.e= parameter estimate; s.e. = standard error (in parentheses). Estimates and test statistics in bold refer to signficancy at the 5% level.												

Table 4: Estimated effects of the financial education program (Cash Quiz = treatment) on the number of correct answers and the probability of correctly answering each of the financial literacy questions by gender and grade

Equations (3) & (5)		<i>Homogeneous</i>		<i>Heterogeneous treatment effect</i>								<i>Test, H0: homogeneous treatment effect</i>	
n=1452		<i>treatment effect</i>		boys grade 5		girls grade 5		boys grade 6		girls grade 6			
		p.e.	s.e.		p.e.	s.e.	p.e.	s.e.	p.e.	s.e.	p.e.	s.e.	p-value
Number of correct answers Q2-Q9	Treatment	0.32	(0.11)		0.16	(0.15)	0.38	(0.24)	0.18	(0.21)	0.51	(0.15)	0.44
	Trend	0.60	(0.09)		0.62	(0.11)	0.73	(0.18)	0.67	(0.18)	0.39	(0.11)	
Q2 Bank balance	Treatment	0.02	(0.03)		0.01	(0.06)	-0.03	(0.07)	-0.01	(0.06)	0.10	(0.06)	0.40
	Trend	0.07	(0.02)		0.03	(0.05)	0.12	(0.06)	0.14	(0.05)	-0.02	(0.04)	
Q3 Loan repayment	Treatment	0.04	(0.04)		0.08	(0.05)	0.14	(0.06)	-0.03	(0.06)	-0.04	(0.05)	0.04
	Trend	0.09	(0.03)		0.06	(0.04)	0.07	(0.04)	0.07	(0.04)	0.15	(0.05)	
Q4 Advertisement in free online games	Treatment	0.02	(0.02)		-0.01	(0.05)	0.04	(0.04)	0.04	(0.05)	0.00	(0.03)	0.72
	Trend	0.02	(0.02)		0.05	(0.04)	0.00	(0.04)	0.02	(0.04)	0.03	(0.02)	
Q5 Free online game, always for free?	Treatment	0.09	(0.04)		-0.02	(0.06)	0.12	(0.06)	0.09	(0.06)	0.19	(0.06)	0.11
	Trend	0.06	(0.03)		0.10	(0.06)	0.07	(0.05)	0.03	(0.04)	0.03	(0.05)	
Q6 Budget diary	Treatment	0.13	(0.04)		0.13	(0.05)	0.04	(0.07)	0.16	(0.05)	0.21	(0.07)	0.36
	Trend	0.18	(0.03)		0.15	(0.04)	0.25	(0.06)	0.19	(0.04)	0.12	(0.04)	
Q7 Euro coins	Treatment	0.04	(0.05)		0.00	(0.07)	0.07	(0.10)	-0.03	(0.06)	0.06	(0.05)	0.69
	Trend	0.10	(0.04)		0.19	(0.06)	0.13	(0.08)	0.10	(0.05)	0.00	(0.04)	
Q8 Balls for sportclub	Treatment	-0.02	(0.03)		-0.10	(0.06)	-0.01	(0.06)	0.03	(0.05)	-0.03	(0.07)	0.36
	Trend	0.07	(0.02)		0.09	(0.05)	0.10	(0.05)	0.04	(0.04)	0.05	(0.05)	
Q9 Interest rate	Treatment	0.01	(0.04)		0.07	(0.06)	0.02	(0.09)	-0.06	(0.06)	0.01	(0.05)	0.53
	Trend	0.02	(0.04)		-0.05	(0.05)	0.00	(0.08)	0.08	(0.05)	0.02	(0.03)	
Notes : p.e= parameter estimate; s.e. = standard error (in parentheses). Estimates and test statistics in bold refer to significance at the 5% level.													

Table 5. Estimates of the financial education (Cash Quiz) program's treatment effect when (in-class) discussion of the pretest in class, (other) financial themes, and degree of Cash Quiz difficulty are controlled for

Additional variables: difficulty level, discussing pretest or financial topics n=1008		<i>Excluded</i>				<i>Included</i>			
		boys grade 5	girls grade 5	boys grade 6	girls grade 6	boys grade 5	girls grade 5	boys grade 6	girls grade 6
Treatment effects									
Number of correct answers	p.e.	0.18	0.25	0.28	0.48	0.18	0.26	0.27	0.47
	s.e.	(0.19)	(0.30)	(0.26)	(0.15)	(0.26)	(0.32)	(0.27)	(0.22)
Q2 Bank balance	p.e.	0.01	-0.07	0.06	0.05	0.02	-0.06	0.04	0.04
	s.e.	(0.08)	(0.09)	(0.07)	(0.07)	(0.08)	(0.08)	(0.07)	(0.09)
Q3 Loan repayment	p.e.	0.09	0.11	-0.05	-0.05	0.06	0.09	-0.12	-0.11
	s.e.	(0.06)	(0.07)	(0.08)	(0.06)	(0.09)	(0.09)	(0.08)	(0.06)
Q4 Advertisement in free online games	p.e.	0.01	0.06	0.01	0.04	0.02	0.07	0.04	0.06
	s.e.	(0.07)	(0.06)	(0.06)	(0.03)	(0.07)	(0.05)	(0.06)	(0.03)
Q5 Free online game, always for free?	p.e.	-0.02	0.22	0.08	0.23	-0.05	0.19	0.05	0.20
	s.e.	(0.07)	(0.08)	(0.07)	(0.05)	(0.07)	(0.07)	(0.07)	(0.05)
Q6 Budget diary	p.e.	0.12	-0.05	0.15	0.16	0.16	-0.01	0.18	0.20
	s.e.	(0.06)	(0.07)	(0.07)	(0.07)	(0.05)	(0.07)	(0.06)	(0.07)
Q7 Euro coins	p.e.	-0.05	-0.01	-0.01	0.07	-0.08	-0.03	-0.03	0.04
	s.e.	(0.10)	(0.14)	(0.05)	(0.06)	(0.10)	(0.12)	(0.09)	(0.09)
Q8 Balls for sportclub	p.e.	-0.12	-0.03	0.05	0.01	-0.10	-0.02	0.11	0.07
	s.e.	(0.07)	(0.08)	(0.06)	(0.09)	(0.08)	(0.07)	(0.06)	(0.09)
Q9 Interest rate	p.e.	0.14	0.02	-0.02	-0.04	0.15	0.03	0.01	-0.02
	s.e.	(0.08)	(0.13)	(0.08)	(0.04)	(0.08)	(0.11)	(0.09)	(0.05)

Notes : p.e= parameter estimate; s.e. = standard error (in parentheses). Estimates and test statistics in bold are significant at the 5% level

Table 6: The effects of the financial education program (Cash Quiz = treatment) on Don't Know responses

Equations (3) & (5)	<i>Homogeneous</i>			<i>Heterogeneous treatment effect</i>								<i>Test, H0: homogeneous</i>
n=1452	<i>treatment effect</i>			boys grade 5		girls grade 5		boys grade 6		girls grade 6		<i>treatment effect</i>
	p.e.	s.e.		p.e.	s.e.	p.e.	s.e.	p.e.	s.e.	p.e.	s.e.	p-value
Number of "Don't know" (DK) answers Q2-Q9	-0.13	(0.10)		-0.09	(0.19)	-0.18	(0.16)	-0.10	(0.17)	-0.11	(0.12)	0.98
DK on Q2 Bank balance	-0.03	(0.03)		-0.12	(0.05)	0.04	(0.05)	-0.03	(0.07)	0.00	(0.06)	0.10
DK on Q3 Loan repayment	-0.02	(0.02)		0.00	(0.03)	-0.03	(0.03)	-0.01	(0.03)	-0.03	(0.02)	0.52
DK on Q4 Advertisement in free online games	-0.01	(0.02)		0.03	(0.03)	-0.05	(0.05)	-0.03	(0.03)	0.03	(0.03)	0.21
DK on Q5 Free online game, always for free?	-0.01	(0.02)		0.04	(0.03)	0.00	(0.03)	0.03	(0.03)	-0.09	(0.04)	0.01
DK on Q6 Budget diary	-0.08	(0.03)		-0.09	(0.06)	-0.04	(0.04)	-0.13	(0.06)	-0.08	(0.05)	0.52
DK on Q7 Euro coins	-0.02	(0.01)		-0.01	(0.03)	-0.04	(0.02)	-0.03	(0.01)	0.02	(0.02)	0.07
DK on Q8 Balls for sportclub	0.02	(0.02)		0.07	(0.06)	-0.04	(0.05)	0.03	(0.03)	0.03	(0.04)	0.62
DK on Q9 Interest rate	0.01	(0.03)		-0.01	(0.05)	-0.02	(0.07)	0.07	(0.04)	0.00	(0.03)	0.61
<i>Notes : p.e= parameter estimate; s.e. = standard error (in parentheses). Estimates and test statistics in bold refer to significance at the 5% level.</i>												

Table 7: Desirable savings behavior: Determinants of the probability of saving

Dependent variable	Q1 Probability of saving			Δ Q1 Probability of saving	
	Equation (2)			Equation (3)	
Girl	p.e.	0.00	0.01		
	s.e.	(0.01)	(0.01)		
Age ≤ 10	p.e.	0.03	0.03		
	s.e.	(0.02)	(0.02)		
Age ≥ 12	p.e.	-0.01	0.00		
	s.e.	(0.02)	(0.02)		
Grade 6	p.e.	0.00	-0.01		
	s.e.	(0.02)	(0.02)		
Receives pocket money	p.e.	0.06	0.06		
	s.e.	(0.02)	(0.02)		
Does chores for money	p.e.	0.03	0.03		
	s.e.	(0.01)	(0.01)		
Has interest in money matters	p.e.	0.01	0.01		
	s.e.	(0.02)	(0.02)		
(Δ) Q2 Bank balance	p.e.		0.01		0.02
	s.e.		(0.01)		(0.02)
(Δ) Q3 Loan repayment	p.e.		0.02		0.01
	s.e.		(0.02)		(0.02)
(Δ) Q4 Advertisement in free online	p.e.		0.02		-0.01
	s.e.		(0.02)		(0.03)
(Δ) Q5 Free online game, always fo	p.e.		0.00		-0.02
	s.e.		(0.02)		(0.02)
(Δ) Q6 Budget diary	p.e.		0.00		0.03
	s.e.		(0.02)		(0.02)
(Δ) Q7 Euro coins	p.e.		0.00		0.01
	s.e.		(0.02)		(0.02)
(Δ) Q8 Balls for sportclub	p.e.		0.02		0.01
	s.e.		(0.01)		(0.02)
(Δ) Q9 Interest rate	p.e.		0.02		0.03
	s.e.		(0.01)		(0.02)
Treatment (Cash Quiz)	p.e.			0.04	0.04
	s.e.			(0.02)	(0.02)
Constant	p.e.	0.81	0.77	-0.02	-0.02
	s.e.	(0.02)	(0.03)	(0.01)	(0.01)
Number of children (n)		2321	2321	1452	1452
H0: joint significance (Δ) Q2-Q9			0.23		0.50
(p-value)					
H0: joint significance (Δ) Q8 & Q9			0.03		0.25
(p-value)					
Notes : p.e= parameter estimate; s.e. = standard error (in parentheses). Estimates and test					
statistics in bold are significant at the 5% level. All financial literacy variables are in levels in the					
first two columns and in first differences in columns three and four (denoted by Δ).					

Table 8: Heterogeneous treatment effects of the financial education program (Cash Quiz) on the probability of saving

	p.e.	(s.e.)	
Boys grade 5	0.08	(0.03)	
Girls grade 5	0.07	(0.03)	
Boys grade 6	0.03	(0.04)	
Girls grade 6	0.01	(0.03)	
<i>Test, H0:homogeneous</i>			
<i>treatment effect; p-value</i>	0.03		
<i>Notes</i> : p.e= parameter estimate; s.e. = standard error (in parentheses).			
Estimates and test statistics in bold are significant at the 5% level.			