# Parents as Teachers:
# Causal Evidence on Home-Based Parental Tutoring

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**Abstract**

Parental involvement in education requires significant time investments from parents. However, it is unclear if parental efforts result in similar learning effects as teaching in class. This study compares the learning effects of parental tutoring at home and teacher-led instruction. We provide causal evidence based on a randomised controlled trial with 1,434 students in economics education in grade 9 and 10 of Flemish secondary schools in Belgium. The intention-to-treat analysis shows that students' knowledge of the course topics measured at the end of the course increased more in the case of teacher-led instruction compared to parent-led tutoring. However, this difference disappeared in a follow-up test several weeks after the intervention, as both types of teaching achieved persisting learning effects of 0.3-0.5 standard deviations. Data from the 231 participating parents reveal that the parental tutoring intervention increased parents' knowledge. This result shows that parental involvement interventions are not only associated with costs for parents, but can also provide them valuable benefits.

**Keywords**: Parental involvement; Parental tutoring; Randomised controlled trial

**JEL classification**: C93, I21, A21

**Trial registration**: This study is registered in the AEA RCT Registry under the identifier AEARCTR-0004707.



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# 1 Introduction

Parents take an active educative role in early childhood but then widely delegate academic education to the school. Often, parents only offer educational support to their children when they are struggling in school. Indeed, parental involvement is costly for parents, who usually face high opportunity costs with competing demands, such as work, household tasks and several children. From a societal perspective, teaching in the classroom exploits scale economies, which is not possible at home. Yet, during recent school closures due to the global pandemic of COVID-19, parents saw themselves suddenly forced to teach or tutor their children at home. This situation unmasked the lack of causal evidence on the effects of parent-led instruction.

Novel studies based on 2020 data show that distance learning at home, which is often monitored by parents, is less effective than learning at school (e.g., Lichand, Alberto Dória, Leal Neto, & Cossi, 2021; Tomasik, Helbling, & Moser, 2020). Evidence on home-schooling, meaning parents opting out of regular schooling to teach their children at home, found that home-schooled students perform equally well or better than school-educated students (Ray, 2000; Yu, Sackett, & Kuncel, 2016). However, this comparison is strongly limited by small sample sizes and the self-selection of parents into home-schooling, which represents a substantial and controversial life choice. In contrast to home-schooling, tutoring is commonly defined as instruction outside regular school hours (Bray, 2014). Tutoring by parents goes beyond mere monitoring of homework completion and involves direct instruction (Erion, 2006). Parental tutoring in this sense has only been considered in the setting of early childhood (e.g., Haney & Hill, 2007; Wagner, Spiker, & Linn, 2002), where it intends to increase literacy levels to prepare children for compulsory education. Most existing studies about the effects of tutoring that is complementary to secondary education focus on external private tutoring, which is selected and paid for, but not implemented by the parents (Guill, Lüdtke, & Schwanenberg, 2019; Hof, 2014; Zhang, 2013).

In terms of methodology, correlational studies about parental involvement are likely to be distorted by reverse causality, since parents differ in their propensity to provide support

(Li & Hamlin, 2019). The existing experimental evidence on parental tutoring is inconclusive, though. For example, a quasi-experiment with 17 primary school students showed positive effects of a parental tutoring intervention on student achievement (Mitchell & Begeny, 2014), whereas a randomised experiment with 36 students did not identify any significant effects (Powell-Smith, Stoner, Shinn, & Good Ill, 2000). These contradictory results are likely due to the lack of statistical power and selection bias. Lahart, Kelly, and Tangney (2009) evaluate a digital tutoring system based on two small samples of 13 and 36 parents and find that an adaptive system can increase parental self-efficacy in a home-tutoring environment. However, this study did not use a control group without parental intervention and did not consider student outcomes. Causal evidence from a large-scale experiment shows that homework assigned to be completed together with parents leads to similar results as homework assigned to be completed by the student alone (Maldonado, De Witte, & Declercq, 2021). Yet, this evaluation of different forms of homework does not compare parent-led instruction to teacher-led instruction.

It remains thus to be clarified if parental tutoring can substitute a teacher-led class if used as part of a classroom course at school. As inequities in education been found to have widened during the 2020 school closures (e.g., Maldonado & De Witte, 2021; Werner & Woessmann, 2021), it also needs to be verified if short parental tutoring interventions already lead to differential learning effects, in order to avoid that students with less educated parents are left behind.

The present study contributes to the existing literature by comparing the learning effects of parental tutoring at home and traditional teaching in the classroom. We provide causal evidence based on a randomised controlled trial with 1,434 students in economics education in grade 9 and 10 of Flemish secondary schools in Belgium. Along with the innovative research question, this study presents novel findings based on a robust causal identification methodology and a large representative sample.

The intention-to-treat analysis shows that assignment to teacher-led instruction at school increased students' knowledge about the course topics more than assignment to parent-led instruction at home. This advantage of teacher-led instruction appeared to be driven by lower levels of compliance in the parent-led intervention. However, access to either type

of teaching generated similar persisting learning effects of 0.3-0.5 standard deviations several weeks after the intervention. Interestingly, no heterogeneous treatment effects could be detected. The observed effects remained constant across different background characteristics of the students and parents, both for the intention-to-treat and the compliers. The findings therefore demonstrate that replacing a single class at school with home-based teaching by parents in the framework of a classroom course leads to comparable learning gains for all students, independent of their background.

Finally, the unique experimental setting allowed us to evaluate data from the 231 parents who completed both a pretest and a posttest. The analysis revealed the striking finding that parents experienced significant knowledge gains from tutoring their children. We hence conclude that parental tutoring provides valuable benefits for parents.

The following section describes the materials and methods, including the intervention, the test instruments, the sample and the methodology. Subsequently, we report the results on students' and parents' knowledge, as well as the robustness checks. The final section provides a discussion and conclusion.

## 2 Materials and Methods

The effectiveness of parental tutoring was tested in a randomised controlled trial with 1,448 students in grade 9 and 10. This section presents the intervention, test instruments, sample and methodology used in the study.

### 2.1 Intervention

In order to compare parental tutoring to teacher-led instruction in a realistic context of a course at school, two treatment groups were assigned to a four-hour economics course about the labour market, social security, demography, immigration and income inequality. These topics of civic education were selected as they represent knowledge which prepares for informed participation in the society as future voters and tax payers. The knowledge taught in this course is consequently of high importance for both students and their par-

ents.

The course consisted of three computer classes and one tutoring class with an interactive discussion. The discussion class was placed in between the computer classes in order to maximise participation in the posttest, which was organised by teachers following the last computer class[1]. In treatment group 1 (teacher-led instruction in the classroom), the discussion took place in the class and was led by the teacher. In treatment group 2 (parent-led tutoring), the same discussion was given as a homework assignment to be completed with a parent. Students in the control group did not receive any treatment, that is neither the classes nor the interactive discussion class. This allows us to evaluate the overall effectiveness of the course in the two different settings. Table 1 provides an overview of the experimental design.

The three computer classes of the course embedded the tutoring intervention in a course structure. In this way, the intervention could be evaluated in the context of a typical situation at school, simulating realistic conditions for potential parental involvement policies. The computer classes consisted of a digital adaptive learning environment that students completed in teams of two. To ensure random assignment of the groups, teachers received a puzzle on the basis of which students were randomly allocated to pairs.[2] In the learning environment, which was provided via a website, students needed to solve questions in a virtual 'urban trail' through the country's capital.[3] A competitive element incentivised students to correctly solve all questions in time.

The course material was developed by the research team and tailored to the targeted grade levels. Via information sheets, students could independently acquire the necessary knowledge and did not rely on the help of the teacher. This independent learning as

[1] Since the posttest was digitally completed, this scheme avoided that teachers would have to book a room with computers only for the test, which could be an incentive to skip the test. It also provided an incentive for the homework assignment in treatment group 2, which students were told was necessary for the last computer class.

[2] Iterbeke, De Witte, Declercq, and Schelfhout (2020) show that the grouping of students does not affect learning outcomes.

[3] The learning environment used in the intervention can be found at https://2financiele-geletterdheid.org/4-de-overheid/.

Table 1: Experimental Design

| **Control** | **Treatment 1** | **Treatment 2** | **Timeline** | |
|---|---|---|---|---|
| | *Teacher-led* | *Parent-led* | *Wave 1* | *Wave 2* |
| Registration | | | August 15 - September 15 | September 16 - October 15 |
| Student pretest<br>Parent pretest<br>Teacher questionnaire | | | September 16 - October 4 | October 15 - November 4 |
| Randomisation | | | October 4 | October 28 |
| | Computer class<br>*2 hours* | | October 4 - November 29 | October 28 - November 29 |
| | Discussion in class<br>*1 hour* | Discussion with parents<br>*1 hour* | | |
| | Student midline test<br>Parent posttest | | | |
| | Computer class<br>*1 hour* | | | |
| | Student posttest<br>Teacher questionnaire | | | |
| | Second Posttest | | January 10 - February 21 | |

well as the highly standardised digital learning environment kept the teacher intervention in the computer classes to a minimum, mainly reduced to providing technical support.[4] With additional explanations for low-ability students and less details for more advanced learners, the course was suitable for both grade 9 and 10 and the different ability tracks.

After two computer classes, students paused their work on the digital learning environment for a tutoring class with an interactive discussion. As the tutoring class dealt with topics that were not covered in the computer classes, it did not matter how far students had progressed during the first two classes.[5]

The content of the tutoring class was the same for both treatment groups. The treatment only differed by the discussion being guided by the teacher in class in the teacher-led treatment and by a parent at home in the parent-led treatment. Students in the parent-led treatment were given the task as a homework and asked to complete it together with a parent.[6]

All materials used for the tutoring class for the different treatments are provided in Appendix C. The discussion in the tutoring class consisted of eleven sequential statements, which were embedded in an online survey. Seven of the statements had an objectively correct or wrong answer, while the remaining four were controversial and could subjectively be agreed or disagreed with. Teachers and parents received the same instructions to read and discuss each statement with the students, to take a common decision on each of them and then to read and discuss the respective background information about the statement shown on the following page. In the teacher-led treatment, the discussion was guided by the teacher and the decision was taken by a majority vote in class. In the parent-led treatment, students discussed with one of their parents and had to find a consensus with them.

Parents did not receive any further information or preparation in advance. In the parent-

[4] Any teacher interventions beyond technical support would not influence the results, as the random assignment ensures that confounding factors are equally distributed in both treatment groups.

[5] The random assignment of treatment also ensures any differences in acquired knowledge from the first two classes to be equally distributed in both treatment groups.

[6] While tutoring is commonly defined as one-on-one or small-group academic instruction aimed at supplementing, rather than replacing, classroom-based education (Nickow, Oreopoulos, & Quan, 2020), this intervention was designed to test if parental one-on-one instruction can provide the same learning benefits as teacher-led group instruction.

led treatment, the statements appeared alternating in a survey for the student and a survey for the parent, in order to stimulate interaction and to ensure that students effectively involved a parent. Both surveys can be found in Appendix C. At the end of the discussion, students could view statistics about the decisions of the students in the same treatment group who had completed the survey before them.

## 2.2 Test Instruments

All questionnaires were administered in an online survey tool. The questionnaires and teaching materials were sent by e-mail to the participating teachers who were instructed to distribute these to the students and parents. As an incentive, teachers could win a book voucher if their classes filled in all questionnaires. To confirm the validity and reliability of the tests, the questionnaires were administered in two pilot schools before the start of the experiment.

Table 1 shows the timing of the tests. All participating students completed a pretest before the start of the intervention which was administered by the teachers at school. At the same point in time, the teachers were asked to complete a short survey with background characteristics and to give students a handout for their parents with a link to the parent pretest.

At the end of the tutoring class, students in both treatment groups completed a midline test, which was given in the form of a short quiz. In the teacher-led treatment, the midline test was a quiz given by the teacher after the discussion class. In the parent-led treatment, the same quiz was part of the homework task with the parental tutoring. In the parent-led treatment, parents were asked to complete a posttest at the end of the tutoring class. In the teacher-led treatment, teachers were asked to give the parent posttest via students to the parents after the tutoring class. In the control group, the parent posttest was assigned at the same time as the student posttest.

All participating students completed a posttest at the end of the intervention.[7] As an

[7]As the content of course was, at the time of the experiment, not part of the curriculum, it could be ensured that the students in the control group did not receive any teaching on the subject of the treatment. In both treatment groups, students completed the posttest at the end of the final class of the course. Since teachers in the treatment groups could choose the exact timing of the classes within the intervention period

incentive to participate, the teachers in the control group received the teaching material after their students completed the posttest. The teachers were asked to complete a short survey at the end of the intervention about the implementation of the course.

Six weeks after the end of the intervention, a second posttest was given to students in the two treatment groups. At the end of the midline test, the posttest and the second posttest, students could see their score and the correct answers to the knowledge questions.

Since the topics of the tutoring class differed from the topics of the computer class, the tests were designed to separately capture the acquired knowledge. The general knowledge was measured at the pretest and posttest on a set of ten questions that covered all course topics. At the midline test, the posttest and the second posttest, students' knowledge was also assessed on five questions about the topics of the tutoring class.

To test if treatment effects were truly due to the specific treatment or rather part of a general increase in knowledge (e.g., Fryer, 2016), we included placebo questions. The placebo score measured general financial literacy, which was not covered in the course, based on the three questions which are commonly used in financial literacy assessments (Lusardi, Mitchell, & Curto, 2010). In the pretest and the posttest, students were also asked to self-evaluate their confidence about their answers on all knowledge questions on a Likert scale from 1 to 5.

In addition to the knowledge questions, the pretest measured background characteristics of students. Socioeconomic status was approximated by the number of travels abroad in the year before the intervention.[8] The measure of family wealth and its subset of information and communications technology (ICT) resources in the home were based on questions of the Programme for International Student Assessment (PISA) 2015 of the Organisation for Economic Co-operation and Development (OECD), which are based on possessions in the home (OECD, 2017).

for practical reasons, the duration from pretest to posttest is, with on average six weeks between the two tests, significantly longer in the treatment groups than the average duration in the control group of three weeks. However, students did not receive any solutions of the first test and teachers were instructed not to discuss the test in class. If the first test resulted in a learning effect, our results represent a lower bound, since recall could have been better in the control group.

[8]Maldonado et al. (2021) demonstrate that travels abroad are a suitable proxy for the socioeconomic status of secondary school students in Flanders. Given the low compliance among parents, questions about the background of parents asked to parents themselves could not be used in the analysis of student outcomes.

The parent tests assessed parents' knowledge about the course topics on six questions.[9] The parent pretest measured parents' background characteristics as well as the extent of parental involvement. In particular, parental involvement was measured by the frequency of family communication about the course topics and the frequency of help with homework. To approximate family communication culture, conversation orientation, measuring the openness of dialogue among family members, was assessed on a set of four questions based on the scale of Hanson and Olson (2018). Conformity orientation, that is the degree to which obedience and acceptance of hierarchy are primary in the family, was measured on a single question from the scale of Hanson and Olson (2018). In addition, parents were asked to self-assess their knowledge on the course topics in general and migration, which was featured in the tutoring class, in particular. Self-assessment of the knowledge about migration was based on a question of PISA 2015 (OECD, 2017). All questionnaires are provided in appendix D.

## 2.3 Sample

The experiment took place between September and November 2019. Table 1 provides a timeline of the experiment. Between August and October 2019, schools were recruited via an open call. Schools that registered before September 15 were assigned to a first wave in which teachers could implement the course in October or November. Schools that registered after September 15 were assigned to a second wave with implementation of the course in November. Assuming that the availability of teachers in October or November to be exogenous, this experimental design with two waves increases the power of the results as the same protocol is repeated with new subjects (Levitt & List, 2009)[10]. Randomisation to the three experimental groups was done at school level in order to avoid spill-over effects between teachers and classes.

Table 2 provides an overview of the final sample at baseline. The final sample consisted of

[9] Only one of the parents had to fill in the surveys. For the final sample of parents, observations were kept if the same parent had filled in both surveys.

[10] This study design implies verification of the results by relying on a sort of replication which uses the same protocol applied to different subjects (Levitt & List, 2009). Already a small number of replications can significantly increase the probability that the finding is true in a limited experimental setting (Maniadis, Tufano, & List, 2014).

1,434 students from 62 schools. Participating students were in grade 9 and 10, that is the third and fourth year of secondary education, and, on average, aged 15 to 16. Overall, the sample was balanced across treatment groups on most of the collected observable characteristics. The academic background of students in terms of tracking and performance was comparable in all treatment groups. In terms of family background, the measures of socioeconomic status were, on average, higher in the parent-led treatment, compared to the teacher-led treatment and the control group. Since this was balanced at baseline (see table 3.A1 in the appendix), this is due to the attrition of schools between the pretest and the posttest and the clustering of student background characteristics in schools. Other measures of family background were comparable across treatment groups. In the analysis, we control for all student characteristics with imbalances across treatment groups at baseline.

Table 2: Student Characteristics at Baseline

| | (0) Control Mean [SD] | (1) Teacher-led Mean [SD] | (2) Parent-led Mean [SD] | (0)-(1) p-value | (0)-(2) p-value | (1)-(2) p-value |
|---|---|---|---|---|---|---|
| Female | 0.443 | 0.556 | 0.529 | 0.044 | 0.139 | 0.694 |
| | [0.684] | [0.964] | [1.089] | | | |
| Age | 14.721 | 14.793 | 14.769 | 0.656 | 0.745 | 0.887 |
| | [2.184] | [2.718] | [2.439] | | | |
| Grade 9 | 0.496 | 0.453 | 0.415 | 0.788 | 0.561 | 0.825 |
| | [1.933] | [2.819] | [2.476] | | | |
| *Academic career* | | | | | | |
| Private school | 0.714 | 0.863 | 0.758 | 0.224 | 0.776 | 0.469 |
| | [2.226] | [1.535] | [2.719] | | | |
| Academic track | 0.679 | 0.602 | 0.790 | 0.623 | 0.457 | 0.293 |
| | [2.006] | [2.727] | [2.630] | | | |
| Technical track | 0.212 | 0.244 | 0.181 | 0.796 | 0.804 | 0.642 |
| | [1.830] | [2.028] | [2.081] | | | |
| Vocational track | 0.109 | 0.153 | 0.029 | 0.659 | 0.227 | 0.156 |
| | [1.367] | [1.718] | [0.600] | | | |
| Language grade 1/5 | 3.439 | 3.426 | 3.462 | 0.927 | 0.839 | 0.817 |
| | [1.552] | [2.704] | [2.076] | | | |
| Math grade 1/5 | 3.128 | 3.093 | 2.935 | 0.815 | 0.163 | 0.310 |
| | [2.130] | [2.453] | [2.209] | | | |
| Repeated year 0/1 | 0.176 | 0.200 | 0.133 | 0.628 | 0.347 | 0.231 |
| | [0.632] | [0.885] | [0.778] | | | |
| *Family background* | | | | | | |
| Socioeconomic status 1/5 | 3.221 | 3.188 | 3.473 | 0.809 | 0.019 | 0.037 |
| | [1.774] | [2.364] | [1.532] | | | |
| Wealth 0/22 | 14.718 | 14.826 | 15.346 | 0.731 | 0.007 | 0.094 |
| | [3.821] | [5.581] | [3.246] | | | |
| ICT at home 0/9 | 7.181 | 7.495 | 7.571 | 0.053 | 0.000 | 0.605 |
| | [1.842] | [2.870] | [1.106] | | | |
| Has bank account 0/1 | 0.664 | 0.733 | 0.752 | 0.110 | 0.042 | 0.576 |
| | [0.788] | [0.513] | [0.544] | | | |
| Speaks Dutch at home 0/1 | 0.788 | 0.751 | 0.894 | 0.702 | 0.018 | 0.128 |
| | [0.854] | [1.876] | [0.487] | | | |
| Immigration background 0/1 | 0.336 | 0.295 | 0.246 | 0.503 | 0.142 | 0.365 |
| | [1.073] | [0.801] | [0.849] | | | |
| Homework help 1/5 | 1.937 | 1.942 | 1.938 | 0.969 | 0.997 | 0.976 |
| | [1.542] | [2.234] | [2.205] | | | |
| *Family communication* | | | | | | |
| Frequency 1/5 | 2.261 | 2.237 | 2.246 | 0.859 | 0.868 | 0.948 |
| | [1.645] | [2.439] | [1.351] | | | |
| Conversation orientation 1/5 | 3.654 | 3.638 | 3.680 | 0.786 | 0.615 | 0.543 |
| | [0.600] | [1.085] | [0.989] | | | |
| Conformity 1/5 | 3.427 | 3.326 | 3.369 | 0.117 | 0.377 | 0.576 |
| | [0.826] | [1.111] | [1.227] | | | |
| *Self-assessment* | | | | | | |
| Financial knowledge 1/5 | 3.532 | 3.433 | 3.521 | 0.207 | 0.863 | 0.277 |
| | [1.055] | [1.331] | [1.088] | | | |
| Economic knowledge 1/5 | 2.906 | 2.844 | 2.990 | 0.218 | 0.168 | 0.005 |
| | [0.980] | [0.547] | [0.919] | | | |
| Migration 0/3 | 1.740 | 1.765 | 1.727 | 0.793 | 0.869 | 0.665 |
| | [1.438] | [1.474] | [1.147] | | | |

*This table continues on the following page.*

*Continued From Previous Page:* Student Characteristics at Baseline

| | (0) Control Mean [SD] | (1) Teacher-led Mean [SD] | (2) Parent-led Mean [SD] | (0)-(1) p-value | (0)-(2) p-value | (1)-(2) p-value |
|---|---|---|---|---|---|---|
| *Motivation* | | | | | | |
| Financial knowledge 1/5 | 4.281 | 4.258 | 4.369 | 0.669 | 0.169 | 0.058 |
| | [0.967] | [0.653] | [1.047] | | | |
| Economic knowledge 1/5 | 3.601 | 3.644 | 3.673 | 0.496 | 0.475 | 0.769 |
| | [1.092] | [0.865] | [1.944] | | | |
| Number of students | 524 | 430 | 480 | | | |
| Number of schools | 25 | 16 | 21 | | | |

*Notes:* Standard deviations in parentheses. The value displayed for t-tests are p-values. Standard errors are clustered at school level. Students who are not in grade 9 are in grade 10. Private schools are publicly funded, but privately-run (catholic) schools. Private schools attract, on average, students with higher socioeconomic status. Dutch language and math grades refer to the past school term and are self-reported in five categories: <50%, 50-60%, 60-70%, 70-80%, >80%. Grading is not standardised and levels of exam differ by school and study tracks. We approximate socioeconomic status by number of travels abroad in the past year (0, 1, 2, 3, >3). Wealth is approximated by economic possessions, self-reported by the student, as in OECD PISA. ICT is a subset of these economic possessions that relate to ICT.

Table 3 shows the outcome variables at each test. Before the intervention, students answered, on average, four out of ten questions on the general knowledge about the course topics correctly. In the parent-led treatment, the baseline knowledge was, with an average of 4.8 correct questions, slightly higher than in the control group and the teacher-led treatment. The placebo score on financial literacy reveals a testing effect, as it increased slightly in all experimental groups from the pretest to the posttest.

Figure 1 displays the density function of students' knowledge scores at baseline. As reflected in the summary statistics, students in the control group and the teacher-led treatment had a similar distribution of baseline scores, while the distribution of baseline scores in the parent-led treatment was shifted to the right, representing higher knowledge scores before the intervention. A Kolmogorov-Smirnov test for equality of distributions confirms that the distribution of scores in the teacher-led treatment and the control group did not differ significantly at baseline, whereas the distribution of scores in the parent-led treatment differed significantly from the two other experimental groups. We account for this in the analysis by linearly controlling for baseline scores in all specifications and testing the robustness of the results using quantile regression as well as matching.

Table 3: Outcome Variables at the Pretest, Midline Test and Posttest

| | (0) Control | | (1) Teacher-led | | (2) Parent-led | | (0)-(1) | (0)-(2) | (1)-(2) |
|---|---|---|---|---|---|---|---|---|---|
| | *N* | *Mean [SD]* | *N* | *Mean [SD]* | *N* | *Mean [SD]* | *p-value* | *p-value* | *p-value* |
| **Pretest** | | | | | | | | | |
| Knowledge 0/10 | 524 | 4.061 [4.806] | 430 | 4.012 [6.773] | 480 | 4.825 [6.631] | 0.898 | 0.042 | 0.072 |
| Financial literacy 0/3 | 524 | 0.941 [1.558] | 430 | 1.067 [1.550] | 480 | 1.052 [2.016] | 0.211 | 0.331 | 0.896 |
| Confidence 1/5 | 524 | 2.834 [0.961] | 430 | 2.819 [1.422] | 480 | 2.842 [1.404] | 0.847 | 0.919 | 0.805 |
| **Midline test** | | | | | | | | | |
| Targeted knowledge 0/5 | 524 | 2.578 [1.977] | 391 | 3.652 [2.361] | 308 | 3.591 [1.683] | 0.000 | 0.000 | 0.687 |
| **Posttest** | | | | | | | | | |
| Targeted knowledge 0/5 | 524 | 2.578 [1.977] | 430 | 3.533 [3.600] | 480 | 3.398 [3.709] | 0.000 | 0.000 | 0.577 |
| Knowledge 0/10 | 524 | 5.095 [3.790] | 430 | 6.153 [8.471] | 480 | 6.531 [6.533] | 0.019 | 0.000 | 0.453 |
| Financial literacy 0/3 | 524 | 1.387 [2.200] | 430 | 1.456 [2.185] | 480 | 1.625 [2.046] | 0.629 | 0.080 | 0.231 |
| Confidence 1/5 | 524 | 2.803 [1.575] | 430 | 3.019 [2.077] | 480 | 2.975 [1.022] | 0.080 | 0.043 | 0.691 |
| **Second Posttest** | | | | | | | | | |
| Targeted knowledge 0/5 | 524 | 2.578 [1.977] | 92 | 2.989 [2.062] | 176 | 3.358 [3.467] | 0.065 | 0.006 | 0.276 |

*Notes:* Standard deviations in parentheses. The value displayed for t-tests are p-values. Standard errors are clustered at school level. The midline test was only given to the two treatment groups as part of the intervention. Control group scores are taken from the posttest. The second posttest five weeks after the end of the intervention was only given to the two treatment groups. Control group scores are assumed to remain constant and replaced with the scores from the first posttest.

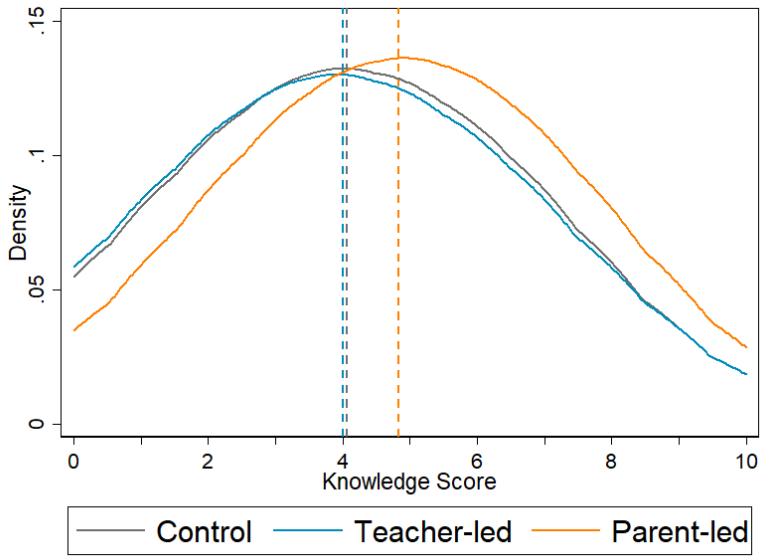


Figure 1: Distribution of Scores at the Pretest

The sample at the midline test comprised 1,223 students, since not all students who completed the pretest and posttest also completed the midline test. Attrition in the teacher-led treatment was due to the teacher not implementing the midline test in class. Attrition in the parent-led treatment was either due to the teacher not assigning the homework or the student not (fully) completing the homework. Table 3.A3 in the appendix shows that, within each treatment group, compliers did not differ significantly from non-compliers. In the teacher-led treatment, compliers were slightly more likely to be in grade 10 than grade 9, to be in a higher track than the vocational track, have a bank account and to estimate themselves higher on financial literacy than non-compliers. However, these differences were only significant at the 10%-level. In the parent-led treatment, compliers were more likely to be male, in a private school, in an academic or technical track and more likely to regularly have their parents help with homework, all significant at the 5%-level. Surprisingly, the differences between compliers and non-compliers regarding their socioeconomic background or language spoken at home were statistically not significant.

The sample of the second posttest comprised 792 students. Table 3.A4 in the appendix presents the differences in student characteristics between the compliers and non-compliers of the second posttest across experimental groups. Overall, compliers with the second posttest were similar to those students who did not complete the second posttest. In the

parent-led treatment, compliers were more likely to be younger, less likely to have repeated a year, and more likely to receive regularly help with homework from their parents and have a higher level of family conformity. In the parent-led treatment, compliers were also less likely to have repeated a year and more likely to estimate themselves to have a good knowledge of migration. All of these differences were at most significant at the 5%-level and all other student background characteristics did not differ significantly between compliers and non-compliers. Therefore, the sample at the second posttest can be considered as representative.

As the second posttest was only given to the two treatment groups, we use posttest scores for the control group, assuming that scores remained constant for the control group in the weeks after the posttest. Although we observe a learning effect from taking the test, with an average 1-point-increase on the 10-point knowledge score from pretest to posttest in the control group, this testing effect is unlikely to increase over time. On the contrary, the testing effect is rather expected to diminish due to the additional time between tests, such that we estimate an upper-bound effect when using the posttest scores as second posttest scores for the control group.

Table 4 shows the data collected from the pretest and posttest for parents. Most of the collected observable background characteristics of parents were similar across experimental groups. At baseline, parents answered on average half of the six knowledge questions correctly. The baseline knowledge of parents in the parent-led treatment was significantly higher than that of parents in the control group and the teacher-led treatment. We therefore linearly control for parents' baseline knowledge in all analyses and test for heterogeneous effects on parental pretest scores.

In the analyses, we limit the sample to those observations, where the same parent filled in both surveys and answered all knowledge questions. This sample comprises 231 parents from the three experimental groups. As we could only collect parent characteristics of those parents who complied with the surveys, we compare compliers and non-compliers among parents based on students' background characteristics. Table 3.A5 in the appendix displays the differences in student characteristics between students of whom the same parent completed both surveys and those students for which this was not the case, by ex-

Table 4: Parent Pretest and Posttest

| | (0) Control | | (1) Teacher-led | | (2) Parent-led | | (0)-(1) | (0)-(2) | (1)-(2) |
|---|---|---|---|---|---|---|---|---|---|
| | *N* | *Mean [SD]* | *N* | *Mean [SD]* | *N* | *Mean [SD]* | *p-value* | *p-value* | *p-value* |
| **Pretest** | | | | | | | | | |
| Parent's education 0/2 | 233 | 1.579 [0.757] | 184 | 1.576 [0.820] | 366 | 1.639 [0.795] | 0.966 | 0.354 | 0.386 |
| Knowledge score 0/6 | 205 | 3.063 [1.802] | 163 | 3.110 [1.742] | 231 | 3.502 [1.863] | 0.799 | 0.015 | 0.037 |
| *Motivation* | | | | | | | | | |
| Economic education 1/5 | 214 | 4.290 [0.636] | 175 | 4.246 [1.204] | 246 | 4.305 [0.578] | 0.659 | 0.789 | 0.543 |
| *Homework help* | | | | | | | | | |
| Frequency 1/5 | 236 | 2.127 [1.224] | 187 | 2.332 [1.591] | 372 | 2.094 [1.726] | 0.149 | 0.782 | 0.109 |
| Enjoys helping 1/5 | 213 | 3.671 [0.992] | 175 | 3.926 [1.050] | 245 | 3.747 [0.839] | 0.018 | 0.383 | 0.066 |
| Interest in schooling 1/5 | 213 | 4.437 [0.854] | 175 | 4.469 [0.605] | 244 | 4.447 [0.381] | 0.665 | 0.873 | 0.670 |
| *Family communication* | | | | | | | | | |
| Frequency 1/5 | 238 | 2.777 [1.222] | 187 | 2.711 [1.515] | 375 | 2.683 | 0.625 | 0.396 | 0.832 |
| Conformity 1/5 | 215 | 3.405 [0.907] | 175 | 3.354 [0.949] | 246 | 3.455 [0.744] | 0.592 | 0.515 | 0.240 |
| Openness 1/5 | 214 | 3.093 [1.085] | 174 | 2.960 [1.045] | 246 | 2.943 [0.903] | 0.219 | 0.113 | 0.863 |
| *Self-assessment* | | | | | | | | | |
| Political knowledge 1/5 | 214 | 3.701 [0.980] | 175 | 3.749 [0.408] | 245 | 3.792 [0.732] | 0.518 | 0.267 | 0.440 |
| Migration 0/3 | 200 | 1.935 [0.715] | 167 | 2.030 [0.893] | 233 | 2.013 [0.927] | 0.267 | 0.325 | 0.852 |
| **Posttest** | | | | | | | | | |
| Knowledge score 0/6 | 103 | 4.019 [1.946] | 85 | 3.941 [2.352] | 304 | 4.786 [1.792] | 0.804 | 0.001 | 0.004 |

*Notes:* Standard deviations in parentheses. The value displayed for t-tests are p-values. Standard errors are clustered at school level. The definition of the different variables can be found in the parent questionnaire, provided in appendix D.

perimental group. Students with complying and non-complying parents were overall similar on most background characteristics. In all experimental groups, children of complying parents were more likely to speak Dutch at home and less likely to have an immigration background, more likely to be in a private school, less likely to have repeated a year and more likely to have a higher knowledge score at baseline. Complying parents hence likely represent the more highly educated parents who might value education and support their child's learning, while parents with an immigration background or a different native language were more difficult to reach. In that sense, the results of the parental data could represent an upper bound.

## 2.4 Methodology

The main specifications for assessing the changes in students' and parents' knowledge are based on an intention-to-treat (ITT) OLS regression, established in the following equation:

$$y^1_{i,j,k} = \alpha_0 + \alpha_1 y^0_{i,j,k} + \sum_1^2 \beta_k treatment_k + \delta \sum X_i + \varepsilon_{i,j}, \tag{1}$$

where $y^1_{i,j,k}$ is the standardised knowledge score of student $i$ in school $j$ measured at the posttest and $y^0_{i,j,k}$ is the standardised baseline knowledge score measured at the pretest. The control group serves as reference group and the coefficients $\beta_k$ identify the ITT effect of access to the treatment for the two treatment groups $k$=*[1,2]*. $\beta_1$ is thus the coefficient for the teacher-led treatment and $\beta_2$ the coefficient for the parent-led treatment. $X_i$ is a vector of covariates of baseline student characteristics that comprises all observable characteristics collected at the pretest which exposed imbalances across treatment groups. The standard errors, $\varepsilon_{i,j}$, are clustered at the school level.

To compare the treatment effects between the two treatment groups, we test for pairwise equality of the coefficients $\beta_1$ and $\beta_2$ based on an F-test. The same model is used to evaluate the two dimensions of general knowledge about the course and the specific knowledge targeted in the tutoring class at the midline test, the posttest and the second posttest, as well as to test the effects on parents' knowledge.

To account for non-compliance with the tutoring class, we estimate the local average treatment effect (LATE) using instrumental variables regression.[11] Because of the randomised treatment assignment, treatment status is clearly a valid instrument. The inclusion restriction is satisfied, as the assignment of tutoring in class or at home is highly correlated with the respective completion. The exclusion restriction is satisfied based on the exogenous assignment of treatment. We estimate the average treatment effect for compliers, that is the treatment effect of the treated, based on the following two-stage-least-squares (2SLS) estimation:

$$D_{i,j,k} = \omega_0 + \omega_1 y^0_{i,j,k} + \sum_1^2 \gamma_k treatment_k + \theta \sum X_i + \upsilon_{i,j} \qquad \text{(Stage 1)}$$

$$y^1_{i,j,k} = \alpha_0 + \alpha_1 y^0_{i,j,k} + \sum_1^2 \beta_k \hat{D}_{i,j,k} + \delta \sum X_i + \varepsilon_{i,j}, \qquad \text{(Stage 2)}$$

where $D_{i,j,k}$ is a binary variable that indicates compliance with the tutoring class in the respective treatment $k$ and $\hat{D}_{i,j,k}$ is the predicted probability to comply, given the treatment assignment. As in the ITT specification, $y^1_{i,j,k}$ represents the standardised knowledge score at the posttest and $y^0_{i,j,k}$ the standardised baseline knowledge score. Again, we control for the student characteristics $X_i$ that were not balanced at baseline. Standard errors $\upsilon_{i,j}$ are clustered at the school level.

# 3 Results

In this section, we present the results for students at the midline test, the posttest and the second posttest. In addition, we show the effects of the intervention on parental knowledge and provide an overview of the robustness checks.

[11] The data allows us to measure compliance in two different ways. First, we measure compliance by the completion of the online survey for the discussion and the midline test, which were both part of the tutoring class. In the teacher-led treatment, the discussion survey was filled in by the teacher. In the parent-led treatment, both the student and the parent had to fill in a part of this survey. This allows us to measure parents' participation in the parent-led treatment. Second, we use self-reported compliance as indicated by the students in the posttest.

### 3.1 Students' Knowledge at the Midline Test

The descriptive statistics in table 3 show that, at the midline test, the targeted knowledge score about the topics of the tutoring class did not differ significantly between the two treatment groups. Students in both treatment groups had significantly higher scores than students in the control group. Intention-to-treat regression analysis, presented in table 5, confirms the descriptive result that students in both treatment groups experienced a significant large knowledge gain immediately after the tutoring class, compared to the control group. In the regression with control variables, we observe a learning effect of 0.83 standard deviations for students assigned to the teacher-led treatment and 0.64 standard deviations for students assigned to the parent-led treatment.

Table 5: Students' Knowledge at the Midline Test: Intention-To-Treat

| | Targeted Knowledge | |
|---|---|---|
| Teacher-led | 0.835*** | 0.834*** |
| | (0.088) | (0.087) |
| Parent-led | 0.665*** | 0.635*** |
| | (0.077) | (0.075) |
| Baseline knowledge | 0.285*** | 0.264*** |
| | (0.030) | (0.031) |
| Controls | No | Yes |
| Teacher-led vs. Parent-led | 0.052 | 0.019 |
| R-squared | 0.229 | 0.240 |
| N | 1223 | 1223 |

*Notes:* OLS regression. Reference category: control group. Standard errors clustered at school level in parentheses. 'Teacher-led vs. Parent-led' indicates the p-value of an F-test for equality of coefficients. Control variables include all variables with imbalances between treatment groups at baseline. Knowledge scores are standardised relative to the control group mean. Control group scores are standardised to have a mean of 0 and a standard deviation of 1. *p<0.10, **p<0.05, ***p<0.01.

The p-values of the F-test for equality of coefficients, shown in the middle panel of table 5, indicate that students who were assigned to teacher-led tutoring had larger immediate learning effects than students assigned to parent-led tutoring. In the regression with control variables, the difference of 0.19 standard deviations between the two coefficients of treatment is significant at the 5%-level.

### 3.2 Students' Knowledge at the Posttest

In table 3, we observe that students' general knowledge about the course topics was in all experimental groups higher at the posttest than at baseline. The increase in the control

group indicates that there was a testing effect and students learned from taking the test, even if no solutions were provided. The increase was significantly larger in both treatment groups, but the difference between the two treatment groups was not significant. The targeted knowledge about the topics of the tutoring class was similar to the scores at the midline test, with no significant difference between the two treatment groups.

Table 6 presents the results from the Intention-to-Treat (ITT) regression analysis of the posttest outcomes. In both dimensions of general knowledge about the course and the specific knowledge targeted in the tutoring class, students assigned to either type of treatment performed significantly better than students in the control group. In the specification with control variables, students in the teacher-led group experienced an average learning effect of 0.52 standard deviations on the general knowledge. In the parent-led group, we detect a comparable effect of 0.50 standard deviations. On the targeted knowledge, the effect is larger in the teacher-led group (0.75 standard deviations) than in the parent-led group (0.48 standard deviations). This difference is significant at the 5%-level. All effects are larger than the minimum detectable effect size of 0.31 at a significance level of 0.05, which was calculated in the preregistration of the experiment[12].

Table 6: Students' Knowledge at the Posttest: Intention-To-Treat

| | Knowledge | | Targeted Knowledge | |
|---|---|---|---|---|
| Teacher-led | 0.523*** | 0.524*** | 0.749*** | 0.748*** |
| | (0.157) | (0.150) | (0.102) | (0.104) |
| Parent-led | 0.531*** | 0.502*** | 0.500*** | 0.478*** |
| | (0.122) | (0.123) | (0.108) | (0.105) |
| Baseline knowledge | 0.444*** | 0.417*** | 0.365*** | 0.348*** |
| | (0.045) | (0.043) | (0.037) | (0.036) |
| Controls | No | Yes | No | Yes |
| Teacher-led vs. Parent-led | 0.963 | 0.891 | 0.050 | 0.027 |
| R-squared | 0.226 | 0.235 | 0.220 | 0.235 |
| N | 1434 | 1434 | 1434 | 1434 |

*Notes:* OLS regression. Reference category: control group. Standard errors clustered at school level in parentheses. 'Teacher-led vs. Parent-led' indicates the p-value of an F-test for equality of coefficients. Control variables include all variables with imbalances between treatment groups at baseline. Knowledge scores at the pretest are standardised relative to the control group. Outcome variables at the posttest are standardised relative to the control group mean at baseline. Control group scores at baseline are standardised to have a mean of 0 and a standard deviation of 1. *p<0.10, **p<0.05, ***p<0.01.

Table 7 shows the results from the instrumental variables (IV) regression, which accounts

[12]The minimum detectable effect size is set before implementation of an experiment for a given level of significance as part of the power calculation. Effects smaller than the minimum detectable effect size cannot be found to be significant in the given sample size.

for compliance with the tutoring class.[13] Intuitively, the local average treatment effects (LATE) for the compliers are larger than the ITT effects. The LATE estimates for teacher-led tutoring are similar to the respective ITT estimates, because the compliance rate was high in this treatment group. The LATE estimates for the parent-led treatment are larger than the corresponding ITT estimates, with 0.83 standard deviations on the general knowledge, and 0.79 standard deviations on the targeted knowledge. This means that the difference between the two treatment groups on the targeted knowledge diminishes to merely 0.04 standard deviations, becoming statistically insignificant. The difference between the two treatment groups on the general knowledge remains insignificant.

Descriptive statistics of the compliers of the tutoring class compared to non-compliers show that the LATE estimates are not driven by one particular group of students, since only a small number of variables showed significant differences between compliers and non-compliers of the parental tutoring (see table 3.A3 in the appendix). In particular, complying students were more likely to be male and in a technical track, less likely to in a private school and an academic track, as well as less likely to receive homework help from their parents at baseline. However, students who complied with the parental tutoring class did not differ significantly from students who did not complete the assigned parent-led tutoring in terms of their socioeconomic status, previous grades, motivation, pretest scores and baseline levels of parental involvement. This was the case for the different proxies of socioeconomic status, based on travels abroad or the PISA indicators of wealth. Similarly, participating parents in the group assigned to parent-led tutoring did not differ significantly from non-participating parents in terms of socioeconomic status or baseline levels of parental involvement. This means that the ITT estimates in table 6 are lower than the LATE results in table 7 due to the diverse group of students who missed the tutoring class and missed out on the content taught there, but who are overall similar in terms of observable characteristics to those students who did complete the tutoring class. Clearly, the ITT estimates are of higher relevance for policy, since they reflect a more realistic estimate which includes the non-compliance that would eventually occur in

[13]The results in table 7 are based on the completion of the discussion survey, completed by the teacher in the teacher-led treatment, or the student and the parent in the parent-led treatment, as well as the completion of the midline test as a measure of compliance. Table 3.B3 in the appendix confirms that the results are similar when using self-reported compliance as indicated by the students in the posttest.

reality. However, the LATE show that the learning effects of parental tutoring are larger among compliers. Given that students were informed that the tests were only used for research purposes and that teachers had no access to the results, compliance rates can likely be raised considerably in graded courses, yielding learning effects closer to the LATE.

Table 7: Students' Knowledge at the Posttest: LATE

| | Knowledge | | Targeted Knowledge | |
|---|---|---|---|---|
| Teacher-led | 0.575*** | 0.582*** | 0.823*** | 0.828*** |
| | (0.164) | (0.157) | (0.104) | (0.107) |
| Parent-led | 0.862*** | 0.828*** | 0.813*** | 0.792*** |
| | (0.173) | (0.180) | (0.142) | (0.143) |
| Baseline knowledge | 0.433*** | 0.409*** | 0.353*** | 0.340*** |
| | (0.043) | (0.041) | (0.032) | (0.032) |
| Controls | No | Yes | No | Yes |
| Teacher-led vs. Parent-led | 0.147 | 0.202 | 0.944 | 0.792 |
| R-squared | 0.211 | 0.221 | 0.228 | 0.241 |
| N | 1434 | 1434 | 1434 | 1434 |

*Notes:* Instrumental variables regression identifying the local average treatment effect (LATE). Reference category: control group. Standard errors clustered at school level in parentheses. 'Teacher-led vs. Parent-led' indicates the p-value of an F-test for equality of coefficients. Control variables include all variables with imbalances between treatment groups at baseline. Knowledge scores at the pretest are standardised relative to the control group. Outcome variables at the posttest are standardised relative to the control group mean at baseline. Control group scores at baseline are standardised to have a mean of 0 and a standard deviation of 1. Compliance is based on the completion of discussion and midline test questionnaires. *p<0.10, **p<0.05, ***p<0.01.

Regarding students' confidence about their knowledge, regressing the standardised confidence score at the posttest on the treatment indicators and the baseline confidence reveals that students in both treatment groups were significantly more confident about their answers in the posttest than students in the control group (see table 3.B4 in the appendix). As often found in previous literature, this effect differs significantly by gender.[14] Table 3.B5 in the appendix confirms that girls in both treatment groups did not have more confidence in their knowledge than girls in the control group, although the treatment effect on knowledge did not differ by gender. While confidence is shown to have increased in both treatment groups in the regression with both genders, the treatment effect on confidence for boys was not significant in the parent-led treatment, and significantly smaller than the increase in confidence in the teacher-led treatment.

[14]For a recent discussion, see Jouini, Karehnke, and Napp (2018).

### 3.3 Students' Knowledge at the Second Posttest

For the second posttest, the descriptive statistics in table 3 document, compared to the posttest, lower levels of the targeted knowledge in both treatment groups. Yet, the scores of students in both treatment groups were still significantly higher than those of the students in the control group.

The results of the ITT estimation in table 8 confirm that the learning effects measured at the second posttest were in both treatment groups lower than those measured at the posttest. Despite this loss of knowledge compared to the immediate assessment at the end of the intervention, students in both treatment groups still retained significant positive effects compared to the control group. In the regression with control variables, students assigned to teacher-led tutoring experienced a persisting improvement of 0.3 standard deviations compared to the control group, significant at the 10%-level. For students assigned to the parent-led tutoring, the learning effect persisted with 0.45 standard deviations, significant at the 1%-level. The difference of 0.15 standard deviations between the two treatment groups was statistically not significant. This means that, several weeks after the intervention, assignment to either type of teaching leads to comparable learning effects. Figure 3.B1 in the appendix provides an overview of the treatment effects on the targeted knowledge over time.

Table 8: Students' Knowledge at the Second Posttest: Intention-To-Treat

| | Targeted Knowledge | |
|---|---|---|
| Teacher-led | 0.301* | 0.299* |
| | (0.170) | (0.172) |
| Parent-led | 0.458*** | 0.448*** |
| | (0.159) | (0.151) |
| Baseline knowledge | 0.329*** | 0.307*** |
| | (0.031) | (0.033) |
| Controls | No | Yes |
| Teacher-led vs. Parent-led | 0.484 | 0.499 |
| R-squared | 0.165 | 0.188 |
| N | 792 | 792 |

*Notes:* OLS regression. Reference category: control group. Standard errors clustered at school level in parentheses. 'Teacher-led vs. Parent-led' indicates the p-value of an F-test for equality of coefficients. Control variables include all variables with imbalances between treatment groups at baseline. Knowledge scores are standardised relative to the control group mean. Control group scores are standardised to have a mean of 0 and a standard deviation of 1. *p<0.10, **p<0.05, ***p<0.01.

The two left columns of table 9 show that this conclusion remains the same when account-

ing for compliance with the tutoring class using self-reported compliance as indicated by students in the posttest. If, instead, compliance is based on survey completion, the effect for compliers in the parent-led treatment becomes significantly larger than in the teacher-led treatment. This stricter definition of compliance with the tutoring intervention thus leads to the conclusion that recall of the course materials five weeks after the end of the course was significantly higher in the parent-led treatment.

Table 9: Knowledge at the Second Posttest: LATE

| | Targeted knowledge | | | |
|---|---|---|---|---|
| | Self-Reported Compliance | | Compliance Based on Survey | |
| Teacher-led | 0.326* | 0.326* | 0.301* | 0.303* |
| | (0.186) | (0.188) | (0.167) | (0.168) |
| Parent-led | 0.632*** | 0.623*** | 0.735*** | 0.726*** |
| | (0.195) | (0.187) | (0.198) | (0.191) |
| Baseline knowledge | 0.326*** | 0.307*** | 0.327*** | 0.306*** |
| | (0.030) | (0.032) | (0.030) | (0.032) |
| Controls | No | Yes | No | Yes |
| Teacher-led vs. Parent-led | 0.234 | 0.240 | 0.078 | 0.077 |
| R-squared | 0.171 | 0.192 | 0.167 | 0.189 |
| N | 792 | 792 | 792 | 792 |

*Notes:* Instrumental variables regression identifying the local average treatment effect (LATE). Reference category: control group. Self-reported compliance instrumented for both treatment groups as indicated in the posttest. Survey-based compliance using completion of student and parent questionnaires in treatment group 2 (perfect compliance based on questionnaire completion for the subsample of students who filled in the second posttest in treatment group 1). Standard errors clustered at school level in parentheses. 'Teacher-led vs. Parent-led' indicates the p-value of an F-test for equality of coefficients. Control variables include all variables with imbalances between treatment groups at baseline. Knowledge scores are standardised relative to the control group mean. Control group scores are standardised to have a mean of 0 and a standard deviation of 1. *p<0.10, **p<0.05, ***p<0.01.

## 3.4 Parents' Knowledge

Table 4 reveals that the average posttest scores of parents in the teacher-led treatment were similar to those of parents in the control group. The average score of parents in the parent-led treatment was significantly higher than in the two other experimental groups. ITT regression analysis, presented in table 10, confirms these descriptive results. Indeed, the teacher-led treatment had no significant effect on parental knowledge. This is in line with the theoretical expectations, since parents in this treatment were not involved and should experience equal effects as parents in the control group. This finding confirms that parents do not seem to get involved in a specific course that the student is following at school when there is no external stimulus to do so.

Table 10: Parental Knowledge

| | Parental Knowledge | |
|---|---|---|
| Teacher-led | 0.093 | -0.017 |
| | (0.162) | (0.139) |
| Parent-led | 0.483*** | 0.351*** |
| | (0.146) | (0.129) |
| Baseline knowledge | 0.457*** | 0.357*** |
| | (0.075) | (0.067) |
| Controls | No | Yes |
| Teacher-led vs. Parent-led | 0.026 | 0.010 |
| R-squared | 0.279 | 0.368 |
| N | 231 | 231 |

*Notes:* OLS regression. Reference category: control group. Standard errors clustered at school level in parentheses. 'Teacher-led vs. Parent-led' indicates the p-value of an F-test for equality of coefficients. Control variables include all student and parent variables with imbalances between treatment groups at baseline. Knowledge scores are standardised relative to the control group mean at baseline. Control group scores are standardised to have a mean of 0 and a standard deviation of 1. *p<0.10, **p<0.05, ***p<0.01.

The parent-led treatment had a significant positive significant effect on parental knowledge about the course topics. In the regression with control variables, the effect of parental tutoring on parents' knowledge relative to the control group is 0.35 standard deviations, significant at the 1%-level. Given the selection of parents due to the high attrition rate, discussed in section 2.3, this effect is likely an upper bound effect for the sample of parents from more advantaged families who completed all surveys.

Given that 93.7% of the parents who filled in the parent pretest agreed that the course topics are important to learn about for their child, but only 14.2% fully agreed to have good knowledge of these topics, the learning effect for parents is likely to be relevant to the parents. Regarding the subtopic of migration, even only 22% of the parents indicated to have a good understanding of the concept. At the same time, 73.14% of the parents stated to enjoy helping with their child's schoolwork and 35.97% said they were helping their child with homework at least once a week. Almost all of the parents (97.15%) indicated to be interested in their child's school work. Hence, the learning benefits for parents are likely to be valuable for the student-parent relationship as well as for parents' education as citizens, voters and taxpayers.

## 3.5 Robustness Checks

The main results remain robust in a number of tests, including considering a placebo score, heterogeneous effects and quantile regression, accounting for teacher characteristics, Lee bounds and matching of student characteristics.

Table 3.B2 in the appendix reveals that there were no spill-over effects of treatment on general financial literacy, which was used as 'placebo' score. This finding confirms that the effects on knowledge about the course were not merely driven by a testing effect.

The results of both the ITT and the LATE estimation are robust across subsamples based on baseline characteristics. We find no heterogeneous effects with respect to the characteristics listed in the pre-analysis plan, that is socioeconomic status, family communication and initial knowledge. The student outcomes also remain robust with regards to the parent characteristics, such as parents' education, pretest score or motivation, as well as to time differences between the tests. Nevertheless, parental motivation was difficult to assess, since the sample of parents who participated in the survey likely comprises those parents which are more motivated.

Regarding the baseline knowledge of students, quantile regression displays that the treatment effects were largest in the middle of the distribution (see table 3.B6 in the appendix). However, the differences in treatment effects across quantiles were statistically not significant, meaning that there were no distributional effects. Seemingly unrelated regression supports the robustness of the results across subsamples by experimental wave and grade year (see table 3.B7 in the appendix).

The sample of parents is too small to estimate precise heterogeneous effects. Nevertheless, quantile regression on pretest scores, using 1000 bootstrap replications for more precise standard errors, shows that the estimates did not differ significantly across the quantiles.

The experimental set up reduced the role of the teacher to a minimum in order to ensure that the intervention is standardised across classes and schools. To test if the teacher indeed had no significant impact, we interact the teacher characteristics shown in table 3.B1, that is gender, age, years of teaching experience and experience with financial education, with the treatment dummies in an OLS regression of students' general knowledge

at the posttest. This confirms that teachers did not impact the results, since the interaction effects were jointly insignificant ($F(8,57)=1.18$, $p=0.327$).

The average attrition rate was, with 38%, relatively high in this experiment, resulting in imbalances in student characteristics at baseline. Table 3.A2 in the appendix demonstrates that compliers and non-compliers in the control group and the parent-led treatment differed on a small number of observable characteristics. Therefore, we account for selective attrition by calculating bounds on the treatment effects, as suggested by Lee (2009). Trimming of the sample is based on the residuals of a regression of student characteristics on the outcome variable (Merlino, Steinhardt, & Wren-Lewis, 2019). We trim the control group and the teacher-led treatment simultaneously relative to the parent-led treatment, that is the group with the highest attrition rate, which amounts to 46%. This allows us to estimate bounds in a single regression with control variables that can be compared to the original estimates. Since trimming of the groups is done in opposite directions, the resulting bounds are very wide. Figure 3.A1 in the appendix illustrates the impact of the trimmed share on the respective upper and lower bounds at step-wise trimming percentages. For general knowledge at the posttest, the estimate for the teacher-led treatment remained positive and significantly different from zero up to a trimming percentage of 40. The coefficient of the parent-led treatment remained positive and significantly different from zero for trimming up to 30%. For targeted knowledge at the posttest, this cut-off lies at 90% for the teacher-led treatment and 50% for the parent-led treatment.

Finally, we tested the robustness of the results by balancing the sample in terms of student characteristics using coarsened exact matching (Blackwell, Iacus, King, & Porro, 2009). Table 3.B8 in the appendix shows that repeating the ITT regression for the posttest scores on the matched sample yielded comparable results. As the relative size of the effect of the teacher-led treatment compared to the parent-led treatment remains the same in the matched sample, the imbalance in pretest scores recorded at baseline does not affect the results.

# 4 Discussion and Conclusion

This paper evaluated the causal effects of parental tutoring at home compared to teacher-led instruction in the classroom. The study assessed the effects of an intervention with a multi-arm randomised controlled trial with 1,434 students in economics education in grade 9 and 10 in 63 Flemish secondary schools. Student outcomes were collected at three points in time and parental outcomes twice.

The intention-to-treat analysis revealed that assignment to teacher-led instruction at school produced higher scores in immediate tests than assignment to parental tutoring. Still, both types of learning significantly increased students' knowledge compared to a control group. With a 0.75 standard deviations increase in the teacher-led treatment and 0.48 standard deviations in the parent-led treatment on the targeted knowledge in the posttest, the observed effect sizes are very large. This is likely due to the fact that the tests were taken immediately after the class and students in the control group did not receive any treatment, while students in both treatment groups received very specific training on the topics covered in the test.

The advantage of teacher-led instruction over parental tutoring disappeared when accounting for compliance with the treatment. Given the similarity of the compliers and non-compliers in terms of their family background, this means that complying students of different backgrounds can benefit equally from a parent-led tutoring class as from an additional teacher-led class. However, compliance can usually more easily be enforced by the teacher in the classroom than for parent-led instruction at home. Therefore, when using parental tutoring in practice, appropriate measures need to be taken to increase compliance. This could for example be done by making the completion of the task compulsory for students and by integrating the task in graded follow-up work which builds on the parental tutoring session. In addition, parents need to be made aware of the importance of their role and the task. If teachers cannot communicate directly with the parents, communication via the students could be ensured by requiring a signature of the parents to confirm the receipt of the information.

Remarkably, assignment to either type of teaching generated similar learning gains of 0.3-

0.5 standard deviations several weeks after the intervention. This means that, eventually, substituting one hour of teaching in the classroom by assignment to a parent-led tutoring class produces comparable improvements in knowledge. Furthermore, the robustness of the findings across subsamples based on background characteristics shows that replacing a single class at school with a tutoring session at home has similar effects for all students, independent of their background. This is striking, since parental involvement interventions are typically expected to cause differential effects by family background and socioeconomic status. The reason for this absence of heterogeneous effects could be that the intervention was designed to ensure that all information was provided in the task and no specific knowledge or skills was required from the parents.

It has to be noted that, in the present study, students in the teacher-led treatment completed the posttest, on average, in a shorter time after the tutoring class than students in the parent-led treatment. This limitation resulted from the purposeful decision to delegate the practical implementation to teachers in order to simulate realistic conditions. Therefore, teachers chose the exact timing of their classes and almost half of the teachers in the teacher-led treatment organised the midline test on the same day as the posttest. In the parent-led treatment, the midline test was given as homework and the posttest was completed in most cases in the days following the tutoring class. On average, students in the teacher-led treatment completed the posttest 2.5 days after the midline test and students in the parent-led treatment had a longer delay of, on average, seven days between the two tests. It is therefore likely that the treatment effects in the teacher-led treatment reflect an upper bound, while the treatment effects in the parent-led treatment reflect a lower bound on the specific knowledge about the tutoring class.

Interestingly, we find that parental tutoring increased parents' knowledge. It is also remarkable that this result is valid for all parents, independent of their previous knowledge, captured by the pretest score. This means that, besides the costs that parents incur in terms of time and effort, parents can also benefit from parental involvement, as they can experience learning effects.

When considering the costs and benefits of parental involvement, it is clear that parents cannot teach at the same efficiency as teachers at school. Scale economies lower the costs

of teaching a group of students compared to one-on-one teaching at home. However, parental involvement can be used to teach or practice learning material, which is otherwise not covered due to curriculum overload and take advantage of the personalised learning in a one-on-one situation, which is normally only possible in expensive tutoring classes. From a policy-perspective, it is hence interesting that the benefits of parental tutoring are comparable to classroom teaching, while parental tutoring can be used in practice in addition to the existing curriculum rather than as replacement of the regular classes. To reduce the costs for parents, interventions should be limited in time and scope, and make use of the benefits for parents. Consequently, parental tutoring should be used for topics that parents have an interest to learn about and a need for additional knowledge. This is clearly the case in the subject of this intervention, which covered topics of civic education that are relevant for participation in the society. The concept could also be transferred to other topics where continuing adult education is desirable, such as financial literacy, health, nutrition, political education and many more.

Future research can build on these findings and explore if the learning benefits that parents experience from parental involvement feedback to student outcomes in the long-term. As this study looked at a narrow assessment of specific knowledge, a broader assessments of skills and engagement as well as motivation and attitudes would be interesting to consider. Since our results are based on just one hour of instruction, further research should evaluate the effects longer-term interventions of parental tutoring. If the conditional benefits of parental tutoring revealed in this paper were to be confirmed in settings of longer duration, new pathways would open to mitigate the negative effects of home teaching observed after the school lockdown during the COVID-19 pandemic. In an international context, the results of this study could potentially translate to a greater benefit of parental tutoring when the quality of schooling and teachers is lower than in the setting of this study.

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## Declaration of Interest Statement

The authors report there are no competing interests to declare.

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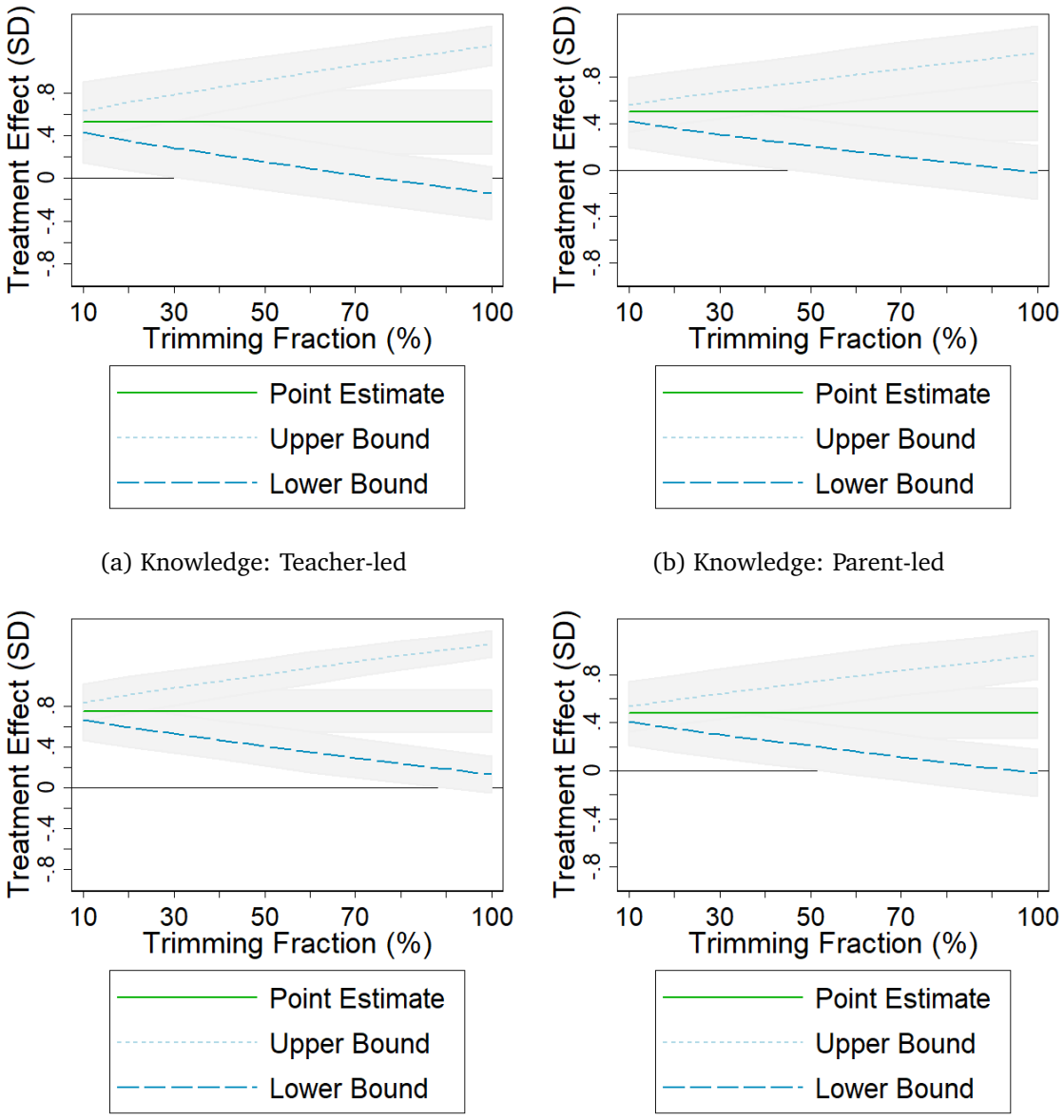
## Appendix A: Sample and Attrition




(a) Knowledge: Teacher-led

(b) Knowledge: Parent-led

(c) Targeted Knowledge: Teacher-led

(d) Targeted Knowledge: Parent-led

Figure 3.A1: Lee Bounds

Table 3.A1: Student Characteristics at Baseline Before Attrition

| | (0) Control Mean [SD] | (1) Teacher-led Mean [SD] | (2) Parent-led Mean [SD] | (0)-(1) p-value | (0)-(2) p-value | (1)-(2) p-value |
|---|---|---|---|---|---|---|
| Female | 0.485 | 0.522 | 0.522 | 0.498 | 0.496 | 0.988 |
| | [1.034] | [1.028] | [1.080] | | | |
| Age | 14.737 | 14.821 | 14.804 | 0.603 | 0.650 | 0.915 |
| | [2.792] | [3.305] | [3.103] | | | |
| Grade 9 | 0.503 | 0.479 | 0.441 | 0.863 | 0.584 | 0.770 |
| | [2.277] | [2.963] | [2.194] | | | |
| *Academic career* | | | | | | |
| Private school | 0.732 | 0.790 | 0.699 | 0.631 | 0.806 | 0.483 |
| | [2.354] | [2.144] | [3.092] | | | |
| Academic track | 0.724 | 0.594 | 0.688 | 0.324 | 0.765 | 0.501 |
| | [2.043] | [2.850] | [2.744] | | | |
| Technical track | 0.182 | 0.236 | 0.178 | 0.601 | 0.966 | 0.563 |
| | [1.811] | [2.064] | [1.968] | | | |
| Vocational track | 0.094 | 0.170 | 0.134 | 0.372 | 0.562 | 0.655 |
| | [1.371] | [1.801] | [1.344] | | | |
| Language grade 1/5 | 3.459 | 3.383 | 3.439 | 0.528 | 0.844 | 0.648 |
| | [1.872] | [2.651] | [2.248] | | | |
| Math grade 1/5 | 3.153 | 3.052 | 2.958 | 0.371 | 0.094 | 0.391 |
| | [2.199] | [2.056] | [2.366] | | | |
| Repeated year 0/1 | 0.181 | 0.227 | 0.184 | 0.323 | 0.954 | 0.429 |
| | [0.803] | [0.937] | [1.254] | | | |
| *Family background* | | | | | | |
| Socioeconomic status 1/5 | 3.234 | 3.171 | 3.295 | 0.623 | 0.581 | 0.351 |
| | [1.940] | [2.839] | [2.453] | | | |
| Wealth 0/22 | 14.543 | 14.746 | 15.010 | 0.565 | 0.193 | 0.385 |
| | [7.412] | [5.753] | [6.542] | | | |
| ICT at home 0/9 | 7.082 | 7.425 | 7.394 | 0.093 | 0.113 | 0.843 |
| | [4.329] | [3.113] | [3.089] | | | |
| Has bank account 0/1 | 0.666 | 0.737 | 0.718 | 0.049 | 0.172 | 0.535 |
| | [0.759] | [0.546] | [0.709] | | | |
| Speaks Dutch at home 0/1 | 0.747 | 0.739 | 0.823 | 0.936 | 0.232 | 0.351 |
| | [1.303] | [2.191] | [1.165] | | | |
| Immigration background 0/1 | 0.379 | 0.324 | 0.312 | 0.401 | 0.333 | 0.854 |
| | [1.278] | [1.186] | [1.472] | | | |
| Homework help 1/5 | 1.940 | 1.915 | 1.890 | 0.797 | 0.569 | 0.814 |
| | [1.498] | [2.164] | [1.962] | | | |
| *Family communication* | | | | | | |
| Frequency 1/5 | 2.272 | 2.242 | 2.219 | 0.755 | 0.535 | 0.812 |
| | [1.659] | [2.038] | [1.709] | | | |
| Conversation orientation 1/5 | 3.693 | 3.657 | 3.646 | 0.501 | 0.374 | 0.847 |
| | [0.977] | [1.059] | [1.102] | | | |
| Conformity 1/5 | 3.449 | 3.389 | 3.384 | 0.293 | 0.208 | 0.929 |
| | [0.906] | [1.198] | [1.117] | | | |
| *Self-assessment* | | | | | | |
| Financial knowledge 1/5 | 3.540 | 3.452 | 3.508 | 0.133 | 0.593 | 0.320 |
| | [1.112] | [1.074] | [1.225] | | | |
| Economic knowledge 1/5 | 2.941 | 2.867 | 3.001 | 0.106 | 0.271 | 0.009 |
| | [0.931] | [0.764] | [1.232] | | | |
| Migration 0/3 | 1.754 | 1.745 | 1.688 | 0.907 | 0.366 | 0.440 |
| | [1.499] | [1.577] | [1.391] | | | |

*This table continues on the following page.*

Table 3.A1: *Continued From Previous Page:*
Student Characteristics at Baseline Before Attrition

| | (0) Control Mean [SD] | (1) Teacher-led Mean [SD] | (2) Parent-led Mean [SD] | (0)-(1) p-value | (0)-(2) p-value | (1)-(2) p-value |
|---|---|---|---|---|---|---|
| *Motivation* | | | | | | |
| Financial knowledge 1/5 | 4.284 | 4.236 | 4.295 | 0.369 | 0.852 | 0.252 |
| | [1.104] | [0.875] | [1.184] | | | |
| Economic knowledge 1/5 | 3.626 | 3.605 | 3.672 | 0.744 | 0.568 | 0.385 |
| | [1.271] | [1.185] | [1.916] | | | |
| *Outcome variables* | | | | | | |
| Knowledge score 0/10 | 4.093 | 3.825 | 4.281 | 0.359 | 0.551 | 0.196 |
| | [4.598] | [6.322] | [7.930] | | | |
| Financial literacy score 0/3 | 0.940 | 1.008 | 0.962 | 0.362 | 0.803 | 0.612 |
| | [1.399] | [1.429] | [2.213] | | | |
| Confidence 1/5 | 2.844 | 2.837 | 2.850 | 0.921 | 0.910 | 0.854 |
| | [0.969] | [1.607] | [1.277] | | | |
| Number of students | 680 | 737 | 903 | | | |
| Number of schools | 27 | 25 | 29 | | | |
| F-test | | | | 0.000 | 0.003 | 0.000 |

*Notes:* Standard deviations in parentheses. The value displayed for t-tests are p-values. The bottom row displays the p-values of an F-test for joint significance. Standard errors are clustered at school level. Students who are not in grade 9 are in grade 10. Private schools are publicly funded, but privately-run (catholic) schools. Private schools attract, on average, students with higher socioeconomic status. Dutch language and math grades refer to the past school term and are self-reported in five categories: <50%, 50-60%, 60-70%, 70-80%, >80%. Grading is not standardised and levels of exam differ by school and study tracks. We approximate socioeconomic status by number of travels abroad in the past year (0, 1, 2, 3, >3). Wealth is approximated by economic possessions, self-reported by the student, as in OECD PISA. ICT is a subset of these economic possessions that relate to ICT.

Table 3.A2: Differences between Compliers and Non-Compliers by Experimental Group

| | Control | | Teacher-led | | Parent-led | |
|---|---|---|---|---|---|---|
| | *Diff.* | *p-value* | *Diff.* | *p-value* | *Diff.* | *p-value* |
| Female | -0.185 | 0.086 | 0.080 | 0.100 | 0.016 | 0.800 |
| Age | -0.067 | 0.816 | -0.067 | 0.748 | -0.075 | 0.730 |
| Grade 9 | -0.029 | 0.889 | -0.061 | 0.649 | -0.056 | 0.746 |
| *Academic career* | | | | | | |
| Private school | -0.081 | 0.609 | 0.175 | 0.127 | 0.127 | 0.369 |
| Academic track | -0.192 | 0.033 | 0.019 | 0.891 | 0.217 | 0.152 |
| Technical track | 0.128 | 0.077 | 0.019 | 0.843 | 0.006 | 0.955 |
| Vocational track | 0.064 | 0.141 | -0.039 | 0.679 | -0.224 | 0.010 |
| Language grade 1/5 | -0.087 | 0.623 | 0.103 | 0.457 | 0.051 | 0.745 |
| Math grade 1/5 | -0.109 | 0.548 | 0.100 | 0.560 | -0.048 | 0.749 |
| Repeated year 0/1 | -0.023 | 0.746 | -0.064 | 0.409 | -0.108 | 0.069 |
| *Family background* | | | | | | |
| Socioeconomic status 1/5 | -0.054 | 0.696 | 0.042 | 0.751 | 0.381 | 0.001 |
| Wealth 0/22 | 0.762 | 0.483 | 0.190 | 0.647 | 0.717 | 0.100 |
| ICT at home 0/9 | 0.431 | 0.523 | 0.170 | 0.430 | 0.377 | 0.067 |
| Has bank account 0/1 | -0.009 | 0.879 | -0.010 | 0.758 | 0.074 | 0.053 |
| Speaks Dutch at home 0/1 | 0.179 | 0.285 | 0.028 | 0.676 | 0.151 | 0.016 |
| Immigration background 0/1 | -0.190 | 0.146 | -0.069 | 0.338 | -0.142 | 0.055 |
| Homework help 1/5 | -0.012 | 0.895 | 0.066 | 0.639 | 0.101 | 0.418 |
| *Family communication* | | | | | | |
| Frequency 1/5 | -0.046 | 0.706 | -0.010 | 0.947 | 0.057 | 0.619 |
| Conversation orientation 1/5 | -0.170 | 0.082 | -0.044 | 0.496 | 0.072 | 0.162 |
| Conformity 1/5 | -0.092 | 0.371 | -0.153 | 0.118 | -0.033 | 0.655 |
| *Self-assessment* | | | | | | |
| Financial knowledge 1/5 | -0.032 | 0.770 | -0.046 | 0.585 | 0.027 | 0.713 |
| Economic knowledge 1/5 | -0.151 | 0.063 | -0.055 | 0.317 | -0.025 | 0.782 |
| Migration 0/3 | -0.061 | 0.569 | 0.049 | 0.591 | 0.084 | 0.352 |
| *Motivation* | | | | | | |
| Financial knowledge 1/5 | -0.014 | 0.884 | 0.053 | 0.439 | 0.158 | 0.024 |
| Economic knowledge 1/5 | -0.110 | 0.382 | 0.094 | 0.325 | 0.002 | 0.990 |
| *Outcome variables* | | | | | | |
| Knowledge score 0/10 | -0.138 | 0.588 | 0.448 | 0.227 | 1.161 | 0.002 |
| Financial literacy score 0/3 | 0.005 | 0.950 | 0.142 | 0.129 | 0.192 | 0.085 |
| Confidence 1/5 | -0.044 | 0.623 | -0.045 | 0.495 | -0.019 | 0.818 |
| | *Non-C.* | *Compl.* | *Non-C.* | *Compl.* | *Non-C.* | *Compl.* |
| Number of students | 156 | 524 | 307 | 430 | 423 | 480 |
| Number of schools | 5 | 22 | 14 | 11 | 14 | 15 |

*Notes:* The difference (diff.) indicates the difference in means of compliers (compl.) minus non-compliers (non-c.). The value displayed for t-tests are p-values. Standard errors are clustered at school level. Compliers are defined as those students who filled in the pretest and the posttest. Private schools are publicly funded, but privately-run (catholic) schools. Private schools attract, on average, students with higher socioeconomic status. Dutch language and math grades refer to the past school term and are self-reported in five categories: <50%, 50-60%, 60-70%, 70-80%, >80%. Grading is not standardised and levels of exam differ by school and study tracks. We approximate socioeconomic status by number of travels abroad in the past year (0, 1, 2, 3, >3). Wealth is approximated by economic possessions, self-reported by the student, as in OECD PISA. ICT is a subset of these economic possessions that relate to ICT.

Table 3.A3: Tutoring Class: Compliers and Non-Compliers by Experimental Group

| | Teacher-led | | Parent-led | |
|---|---|---|---|---|
| | *Difference* | *p-value* | *Difference* | *p-value* |
| Female | -0.188 | 0.149 | -0.135 | 0.005 |
| Age | -0.054 | 0.790 | 0.213 | 0.120 |
| Grade 9 | 0.263 | 0.059 | -0.048 | 0.654 |
| *Academic career* | | | | |
| Private school | 0.066 | 0.347 | -0.177 | 0.069 |
| Academic track | -0.239 | 0.215 | -0.219 | 0.029 |
| Technical track | 0.324 | 0.112 | 0.151 | 0.032 |
| Vocational track | -0.084 | 0.070 | 0.068 | 0.263 |
| Language grade 1/5 | -0.073 | 0.646 | -0.072 | 0.435 |
| Math grade 1/5 | 0.039 | 0.896 | -0.100 | 0.293 |
| Repeated year 0/1 | 0.147 | 0.096 | 0.086 | 0.148 |
| *Family background* | | | | |
| Socioeconomic status 1/5 | 0.131 | 0.448 | -0.133 | 0.231 |
| Wealth 0/22 | 0.164 | 0.736 | -0.106 | 0.689 |
| ICT at home 0/9 | -0.206 | 0.566 | -0.043 | 0.685 |
| Has bank account 0/1 | -0.129 | 0.059 | -0.025 | 0.497 |
| Speaks Dutch at home 0/1 | -0.234 | 0.105 | -0.041 | 0.154 |
| Immigration background 0/1 | 0.070 | 0.506 | 0.100 | 0.128 |
| Homework help 1/5 | 0.149 | 0.498 | -0.262 | 0.014 |
| *Family communication* | | | | |
| Frequency 1/5 | 0.359 | 0.247 | 0.011 | 0.895 |
| Conversation orientation 1/5 | -0.068 | 0.603 | 0.064 | 0.207 |
| Conformity 1/5 | -0.048 | 0.723 | -0.054 | 0.493 |
| *Self-assessment* | | | | |
| Financial knowledge 1/5 | -0.222 | 0.053 | 0.126 | 0.215 |
| Economic knowledge 1/5 | 0.143 | 0.151 | 0.079 | 0.408 |
| Migration 0/3 | 0.033 | 0.809 | -0.056 | 0.259 |
| *Motivation* | | | | |
| Financial knowledge 1/5 | -0.002 | 0.981 | -0.028 | 0.721 |
| Economic knowledge 1/5 | 0.138 | 0.182 | -0.084 | 0.420 |
| *Outcome variables* | | | | |
| Knowledge score 0/10 | -0.379 | 0.632 | -0.267 | 0.301 |
| Financial literacy score 0/3 | -0.046 | 0.861 | -0.057 | 0.433 |
| Confidence 1/5 | 0.143 | 0.532 | 0.087 | 0.471 |
| | *Non-Compliers* | *Compliers* | *Non-Compliers* | *Compliers* |
| Number of students | 39 | 391 | 182 | 298 |
| Number of schools | 1 | 25 | 9 | 12 |

*Notes:* The difference indicates the difference in means of compliers minus non-compliers. The value displayed for t-tests are p-values. Standard errors are clustered at school level. Students in the control group did not complete the tutoring class, since they did not receive any treatment. Students in treatment group 1 are compliers if they completed the midline test and their teacher completed the survey of the tutoring class. Private schools are publicly funded, but privately-run (catholic) schools. Private schools attract, on average, students with higher socioeconomic status. Dutch language and math grades refer to the past school term and are self-reported in five categories: <50%, 50-60%, 60-70%, 70-80%, >80%. Grading is not standardised and levels of exam differ by school and study tracks. We approximate socioeconomic status by number of travels abroad in the past year (0, 1, 2, 3, >3). Wealth is approximated by economic possessions, self-reported by the student, as in OECD PISA. ICT is a subset of these economic possessions that relate to ICT.

Table 3.A4: Second Posttest: Compliers and Non-Compliers by Experimental Group

| | Teacher-led | | Parent-led | |
|---|---|---|---|---|
| | *Difference* | *p-value* | *Difference* | *p-value* |
| Female | 0.016 | 0.892 | 0.019 | 0.771 |
| Age | 0.456 | 0.059 | 0.182 | 0.436 |
| Grade 9 | -0.363 | 0.127 | -0.054 | 0.796 |
| *Academic career* | | | | |
| Private school | -0.078 | 0.502 | -0.086 | 0.521 |
| Academic track | -0.022 | 0.929 | -0.081 | 0.459 |
| Technical track | -0.021 | 0.885 | 0.035 | 0.755 |
| Vocational track | 0.043 | 0.760 | 0.046 | 0.311 |
| Language grade 1/5 | -0.150 | 0.630 | -0.194 | 0.162 |
| Math grade 1/5 | -0.075 | 0.678 | 0.068 | 0.651 |
| Repeated year 0/1 | 0.116 | 0.061 | 0.103 | 0.030 |
| *Family background* | | | | |
| Socioeconomic status 1/5 | -0.023 | 0.915 | 0.011 | 0.939 |
| Wealth 0/22 | -0.028 | 0.944 | 0.071 | 0.812 |
| ICT at home 0/9 | 0.022 | 0.930 | 0.067 | 0.585 |
| Has bank account 0/1 | -0.008 | 0.850 | 0.075 | 0.113 |
| Speaks Dutch at home 0/1 | -0.109 | 0.399 | -0.051 | 0.216 |
| Immigration background 0/1 | 0.044 | 0.503 | 0.065 | 0.299 |
| Homework help 1/5 | -0.420 | 0.012 | 0.099 | 0.577 |
| *Family communication* | | | | |
| Frequency 1/5 | 0.025 | 0.903 | -0.042 | 0.666 |
| Conversation orientation 1/5 | -0.097 | 0.251 | 0.038 | 0.656 |
| Conformity 1/5 | -0.208 | 0.082 | 0.080 | 0.548 |
| *Self-assessment* | | | | |
| Financial knowledge 1/5 | -0.127 | 0.482 | -0.012 | 0.917 |
| Economic knowledge 1/5 | -0.032 | 0.794 | 0.055 | 0.581 |
| Migration 0/3 | 0.005 | 0.959 | -0.117 | 0.072 |
| *Motivation* | | | | |
| Financial knowledge 1/5 | 0.052 | 0.506 | -0.010 | 0.909 |
| Economic knowledge 1/5 | 0.142 | 0.402 | -0.032 | 0.819 |
| *Outcome variables* | | | | |
| Knowledge score 0/10 | -0.206 | 0.711 | -0.240 | 0.637 |
| Financial literacy score 0/3 | 0.086 | 0.698 | -0.142 | 0.415 |
| Confidence 1/5 | -0.092 | 0.551 | -0.035 | 0.864 |
| | *Non-Compliers* | *Compliers* | *Non-Compliers* | *Compliers* |
| Number of students | 338 | 92 | 304 | 176 |
| Number of schools | 13 | 3 | 13 | 8 |

*Notes:* The difference indicates the difference in means of compliers minus non-compliers. The value displayed for t-tests are p-values. Standard errors are clustered at school level. Students in the control group did not receive the second posttest. Private schools are publicly funded, but privately-run (catholic) schools. Private schools attract, on average, students with higher socioeconomic status. Dutch language and math grades refer to the past school term and are self-reported in five categories: <50%, 50-60%, 60-70%, 70-80%, >80%. Grading is not standardised and levels of exam differ by school and study tracks. We approximate socioeconomic status by number of travels abroad in the past year (0, 1, 2, 3, >3). Wealth is approximated by economic possessions, self-reported by the student, as in OECD PISA. ICT is a subset of these economic possessions that relate to ICT.

Table 3.A5: Parents: Compliers and Non-Compliers by Experimental Group

| | Control | | Teacher-led | | Parent-led | |
|---|---|---|---|---|---|---|
| | *Difference* | *p-value* | *Difference* | *p-value* | *Difference* | *p-value* |
| Female | -0.074 | 0.342 | 0.054 | 0.315 | -0.038 | 0.596 |
| Age | 0.315 | 0.064 | 0.166 | 0.385 | 0.145 | 0.207 |
| Grade 9 | -0.104 | 0.415 | -0.104 | 0.525 | 0.000 | 0.998 |
| *Academic career* | | | | | | |
| Private school | -0.163 | 0.061 | 0.064 | 0.700 | -0.139 | 0.027 |
| Academic track | -0.076 | 0.461 | -0.054 | 0.644 | -0.145 | 0.016 |
| Technical track | -0.012 | 0.901 | -0.042 | 0.695 | 0.107 | 0.034 |
| Vocational track | 0.088 | 0.085 | 0.096 | 0.104 | 0.038 | 0.294 |
| Language grade 1/5 | -0.060 | 0.560 | -0.258 | 0.175 | -0.055 | 0.470 |
| Math grade 1/5 | -0.089 | 0.601 | -0.115 | 0.462 | 0.057 | 0.411 |
| Repeated year 0/1 | 0.109 | 0.023 | 0.129 | 0.056 | 0.103 | 0.026 |
| *Family background* | | | | | | |
| Socioeconomic status 1/5 | 0.035 | 0.843 | 0.015 | 0.915 | -0.088 | 0.571 |
| Wealth 0/22 | -0.375 | 0.393 | -0.140 | 0.756 | 0.204 | 0.484 |
| ICT at home 0/9 | -0.101 | 0.608 | -0.137 | 0.463 | 0.157 | 0.406 |
| Has bank account 0/1 | 0.033 | 0.495 | -0.045 | 0.439 | -0.088 | 0.039 |
| Speaks Dutch at home 0/1 | -0.096 | 0.030 | -0.226 | 0.006 | -0.068 | 0.009 |
| Immigration background 0/1 | 0.111 | 0.082 | 0.199 | 0.014 | 0.121 | 0.029 |
| Homework help 1/5 | -0.108 | 0.415 | -0.148 | 0.411 | -0.093 | 0.256 |
| *Family communication* | | | | | | |
| Frequency 1/5 | -0.190 | 0.211 | 0.031 | 0.888 | -0.020 | 0.863 |
| Conversation orientation 1/5 | -0.001 | 0.993 | -0.179 | 0.028 | 0.067 | 0.316 |
| Conformity 1/5 | -0.055 | 0.619 | -0.130 | 0.194 | 0.081 | 0.215 |
| *Self-assessment* | | | | | | |
| Financial knowledge 1/5 | 0.208 | 0.183 | -0.088 | 0.546 | -0.014 | 0.889 |
| Economic knowledge 1/5 | 0.164 | 0.246 | -0.018 | 0.882 | -0.025 | 0.666 |
| Migration 0/3 | 0.120 | 0.281 | -0.149 | 0.068 | -0.003 | 0.960 |
| *Motivation* | | | | | | |
| Financial knowledge 1/5 | -0.042 | 0.618 | -0.127 | 0.007 | -0.001 | 0.990 |
| Economic knowledge 1/5 | -0.020 | 0.842 | -0.127 | 0.239 | -0.097 | 0.464 |
| *Outcome variables* | | | | | | |
| Knowledge score 0/10 | -0.616 | 0.023 | -0.614 | 0.050 | -0.239 | 0.357 |
| Financial literacy score 0/3 | -0.157 | 0.190 | -0.125 | 0.184 | 0.068 | 0.510 |
| Confidence 1/5 | 0.262 | 0.070 | 0.135 | 0.094 | 0.028 | 0.797 |
| | *Non-C.* | *Compl.* | *Non-C.* | *Compl.* | *Non-C.* | *Compl.* |
| Number of students | 461 | 63 | 363 | 57 | 369 | 111 |
| Number of schools | 21 | 4 | 12 | 4 | 14 | 7 |

*Notes:* The difference indicates the difference in means of compliers (compl.) minus non-compliers (non-c.). The value displayed for t-tests are p-values. Standard errors are clustered at school level. Compliers are defined as those students for whom the same parent filled in both the pretest and the posttest and answered all knowledge questions. Private schools are publicly funded, but privately-run (catholic) schools. Private schools attract, on average, students with higher socioeconomic status. Dutch language and math grades refer to the past school term and are self-reported in five categories: <50%, 50-60%, 60-70%, 70-80%, >80%. Grading is not standardised and levels of exam differ by school and study tracks. We approximate socioeconomic status by number of travels abroad in the past year (0, 1, 2, 3, >3). Wealth is approximated by economic possessions, self-reported by the student, as in OECD PISA. ICT is a subset of these economic possessions that relate to ICT.

# Appendix B: Additional Tables and Figures

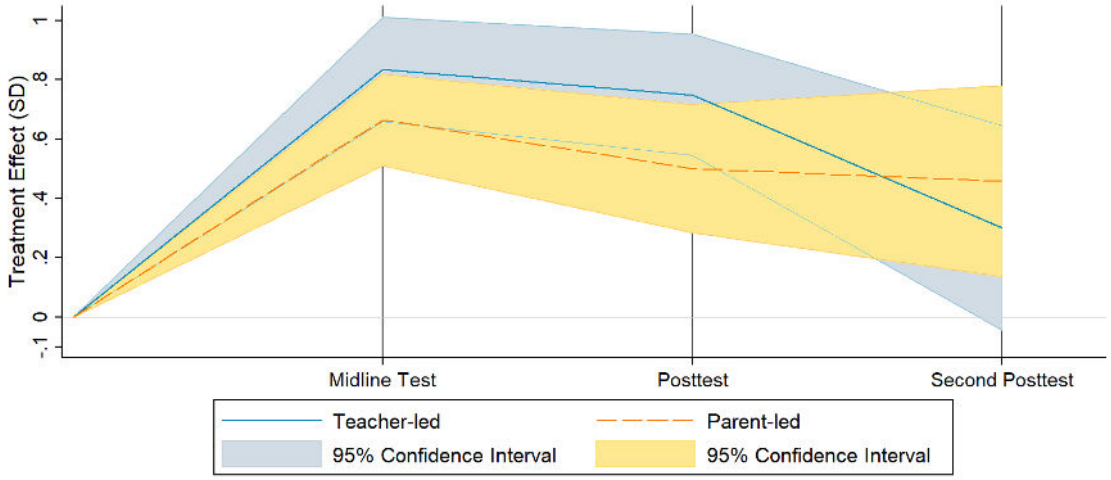



Figure 3.B1: Treatment Effects on Targeted Knowledge Over Time

Table 3.B1: Teacher Characteristics at Baseline

| | (0) Control | | (1) Teacher-led | | (2) Parent-led | | (0)-(1) | (0)-(2) | (1)-(2) |
|---|---|---|---|---|---|---|---|---|---|
| | *N* | *Mean [SD]* | *N* | *Mean [SD]* | *N* | *Mean [SD]* | *p-value* | *p-value* | *p-value* |
| Female teacher | 33 [25] | 0.818 [0.417] | 21 [15] | 0.810 [0.390] | 25 [20] | 0.840 [0.430] | 0.938 | 0.847 | 0.802 |
| Teacher age | 33 [25] | 43.242 [11.688] | 21 [15] | 38.952 [12.576] | 25 [20] | 45.440 [9.224] | 0.213 | 0.427 | 0.057 |
| Taught fin. education | 32 [25] | 0.750 [0.442] | 21 [15] | 0.714 [0.452] | 25 [20] | 0.800 [0.453] | 0.777 | 0.677 | 0.525 |
| Years of experience | 30 [25] | 20.600 [12.886] | 20 [14] | 14.300 [12.807] | 24 [19] | 19.792 [11.364] | 0.095 | 0.807 | 0.144 |

*Notes:* The value displayed for t-tests are p-values. Standard deviations are clustered at school level. Teachers who do not have a university degree, have a degree from a university of applied sciences.

Table 3.B2: Intention-To-Treat: Financial Literacy (Spill-Over)

| | Financial Literacy | |
|---|---|---|
| Teacher-led | 0.085 | 0.115 |
| | (0.133) | (0.124) |
| Parent-led | 0.149 | 0.141 |
| | (0.125) | (0.126) |
| Baseline knowledge | 0.320*** | 0.300*** |
| | (0.029) | (0.027) |
| Controls | No | Yes |
| Teacher-led vs. Parent-led | 0.604 | 0.828 |
| R-squared | 0.100 | 0.127 |
| N | 1434 | 1434 |

*Notes:* OLS regression. Reference category: control group. Standard errors clustered at school level in parentheses. 'Teacher-led vs. Parent-led' indicates the p-value of an F-test for equality of coefficients. Control variables include all variables with imbalances between treatment groups at baseline. Knowledge scores at the pretest are standardised relative to the control group. Outcome variables at the posttest are standardised relative to the control group mean at baseline. Control group scores at baseline are standardised to have a mean of 0 and a standard deviation of 1. *p<0.10, **p<0.05, ***p<0.01.

Table 3.B3: LATE: Knowledge (Self-Reported Compliance)

| | Knowledge | | Targeted Knowledge | |
|---|---|---|---|---|
| Teacher-led | 0.640*** | 0.639*** | 0.916*** | 0.912*** |
| | (0.161) | (0.156) | (0.092) | (0.095) |
| Parent-led | 0.769*** | 0.739*** | 0.729*** | 0.710*** |
| | (0.165) | (0.169) | (0.141) | (0.138) |
| Baseline knowledge | 0.420*** | 0.399*** | 0.334*** | 0.324*** |
| | (0.045) | (0.043) | (0.034) | (0.034) |
| Controls | No | Yes | No | Yes |
| Teacher-led vs. Parent-led | 0.496 | 0.589 | 0.162 | 0.117 |
| R-squared | 0.232 | 0.240 | 0.231 | 0.245 |
| N | 1434 | 1434 | 1434 | 1434 |

*Notes:* Instrumental variables regression identifying the local average treatment effect (LATE). Reference category: control group. Reference category: control group. Standard errors clustered at school level in parentheses. 'Teacher-led vs. Parent-led' indicates the p-value of an F-test for equality of coefficients. Control variables include all variables with imbalances between treatment groups at baseline. Knowledge scores at the pretest are standardised relative to the control group. Outcome variables at the posttest are standardised relative to the control group mean at baseline. Control group scores at baseline are standardised to have a mean of 0 and a standard deviation of 1. *p<0.10, **p<0.05, ***p<0.01.

Table 3.B4: Students' Confidence About Answers at the Posttest

| | Confidence | |
|---|---|---|
| Teacher-led | 0.223** | 0.261*** |
| | (0.094) | (0.090) |
| Parent-led | 0.124 | 0.143* |
| | (0.075) | (0.076) |
| Baseline confidence | 0.406*** | 0.346*** |
| | (0.029) | (0.031) |
| Controls | No | Yes |
| Teacher-led vs. Parent-led | 0.203 | 0.093 |
| R-squared | 0.212 | 0.249 |
| N | 1434 | 1434 |

*Notes:* OLS regression. Reference category: control group. Standard errors clustered at school level in parentheses. 'Teacher-led vs. Parent-led' indicates the p-value of an F-test for equality of coefficients. Control variables include all variables with imbalances between treatment groups at baseline. Confidence is recorded on a Likert scale from 1 to 5 and standardised in the regressions relative to the control group mean. Control group scores are standardised to have a mean of 0 and a standard deviation of 1. *p<0.10, **p<0.05, ***p<0.01.

Table 3.B5: Students' Confidence About Answers at the Posttest by Gender

| | Confidence | |
|---|---|---|
| | Girls | Boys |
| Teacher-led | 0.080 | 0.458*** |
| | (0.081) | (0.121) |
| Parent-led | 0.094 | 0.167 |
| | (0.074) | (0.110) |
| Baseline confidence | 0.412*** | 0.287*** |
| | (0.038) | (0.045) |
| Controls | Yes | Yes |
| Teacher-led vs. Parent-led | 0.853 | 0.002 |
| R-squared | 0.238 | 0.208 |
| N | 725 | 709 |

*Notes:* OLS regression. Reference category: control group. Standard errors clustered at school level in parentheses. 'Teacher-led vs. Parent-led' indicates the p-value of an F-test for equality of coefficients. Control variables include all variables with imbalances between treatment groups at baseline. Confidence is recorded on a Likert scale from 1 to 5 and standardised in the regressions relative to the control group mean. Control group scores are standardised to have a mean of 0 and a standard deviation of 1. *p<0.10, **p<0.05, ***p<0.01.

Table 3.B6: Quantile Regression for Students' Knowledge

| | **Students' Knowledge at the Posttest** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Quantile* | *10* | *20* | *30* | *40* | *50* | *60* | *70* | *80* | *90* |
| Teacher-led | 0.281* | 0.574*** | 0.522*** | 0.613*** | 0.614*** | 0.663*** | 0.596*** | 0.525*** | 0.530*** |
| | (0.170) | (0.100) | (0.090) | (0.087) | (0.083) | (0.093) | (0.097) | (0.092) | (0.080) |
| F-Test | 0.320 | | | | | | | | |
| Parent-led | 0.484*** | 0.507*** | 0.480*** | 0.536*** | 0.578*** | 0.645*** | 0.542*** | 0.407*** | 0.378*** |
| | (0.124) | (0.087) | (0.090) | (0.088) | (0.094) | (0.080) | (0.091) | (0.088) | (0.078) |
| F-Test | 0.147 | | | | | | | | |
| | **Students' Targeted Knowledge at the Posttest** | | | | | | | | |
| *Quantile* | *10* | *20* | *30* | *40* | *50* | *60* | *70* | *80* | *90* |
| Teacher-led | 0.751*** | 0.745*** | 0.819*** | 0.815*** | 0.854*** | 0.908*** | 0.883*** | 0.763*** | 0.775*** |
| | (0.130) | (0.102) | (0.099) | (0.090) | (0.077) | (0.073) | (0.089) | (0.080) | (0.056) |
| F-Test | 0.532 | | | | | | | | |
| Parent-led | 0.381*** | 0.470*** | 0.501*** | 0.477*** | 0.549*** | 0.554*** | 0.576*** | 0.530*** | 0.775*** |
| | (0.119) | (0.085) | (0.090) | (0.091) | (0.074) | (0.071) | (0.086) | (0.088) | (0.080) |
| F-Test | 0.183 | | | | | | | | |

*Notes:* OLS regression with control variables. N=1,434. Reference category: control group. Standard errors clustered at school level in parentheses. Control variables include all variables with imbalances between treatment groups at baseline. The F-test shows the p-value of an F-test for equality of coefficients across quantiles. Knowledge scores at the pretest are standardised relative to the control group. Outcome variables at the posttest are standardised relative to the control group mean at baseline. Control group scores at baseline are standardised to have a mean of 0 and a standard deviation of 1. *p<0.10, **p<0.05, ***p<0.01.

Table 3.B7: Seemingly Unrelated Regression

| | Wave | | Grade | |
|---|---|---|---|---|
| | Knowledge | Targeted Knowledge | Knowledge | Targeted Knowledge |
| Teacher-led | 0.669 | 0.337 | 0.566 | 0.185 |
| Parent-led | 0.176 | 0.699 | 0.943 | 0.642 |

*Notes:* The value displayed are p-values of F-tests for equality of coefficients based on seemingly unrelated regression to compare the first and second wave of the experiment and the participating grades 9 and 10. The regressions include all control variables and standard deviations are clustered at school level.

Table 3.B8: Coarsened Exact Matching: Students' Posttest Scores

| | Knowledge | | Targeted Knowledge | |
|---|---|---|---|---|
| Teacher-led | 0.521*** | 0.513*** | 0.826*** | 0.826*** |
| | (0.173) | (0.173) | (0.104) | (0.109) |
| Parent-led | 0.554*** | 0.519*** | 0.575*** | 0.534*** |
| | (0.139) | (0.147) | (0.119) | (0.118) |
| Baseline knowledge | 0.541*** | 0.508*** | 0.397*** | 0.395*** |
| | (0.059) | (0.058) | (0.049) | (0.049) |
| Controls | No | Yes | No | Yes |
| Teacher-led vs. Parent-led | 0.854 | 0.975 | 0.031 | 0.012 |
| R-squared | 0.304 | 0.317 | 0.266 | 0.288 |
| N | 723 | 723 | 723 | 723 |

*Notes:* OLS regression on a matched sample based on sequential coarsened exact matching of the experimental groups using the following variables: grade year, mathematics grade, home language, track, gender, socioeconomic status, immigration background, frequency of family communication and the pretest score. Reference category: control group. Standard errors clustered at school level in parentheses.'Teacher-led vs. Parent-led' indicates the p-value of an F-test for equality of coefficients. Control variables include all variables with imbalances between treatment groups at baseline. Knowledge scores at the pretest are standardised relative to the control group. Outcome variables at the posttest are standardised relative to the control group mean at baseline. Control group scores at baseline are standardised to have a mean of 0 and a standard deviation of 1. *p<0.10, **p<0.05, ***p<0.01.

# Appendix C: Intervention

Below, the materials used for the intervention in the tutoring class, that is the third class period of the course, are provided. Students in the teacher-led treatment played a discussion game in the class, with the material below provided to their teacher. Students in the parent-led treatment received a handout from their teacher with the instruction to complete the discussion as a homework task with (one of) their parents, and the link to the material provided below. Each statement of the discussion was shown on a separate page. The participants needed to vote their opinion and click on 'next' to proceed to the explanation.

## Tutoring Class Treatment 1 (Teacher-led Treatment)

### Discussion Game: Instructions for the Teacher

This discussion game is an important part of the course about the role of the government on the labour market. The discussion game takes place in the third lecture and should be played with the whole class. After the discussion game, each student has to individually fill in the quiz (link). On the last page of the quiz, students receive a code that is necessary to reach the final destination of the urban trail. At the end of the quiz, students will see their score and the correct solutions.

You can show the following pages with a projector in class, such that the students can read the statements and explanations.

*[identification data of the class]*

In this game, the class will discuss 11 different statements. The game works as follows:

1. The teacher reads the statement.
2. The students say what they think about the statement.
3. The students vote: do you agree or disagree with the statement?
4. The teacher reads the explanations. Discuss if everyone understands the explanations.
5. On the last page you can compare your answers with the answers of other classes.

Statement 1: The government has to set a statutory minimum wage.

- Disagree
- No opinion
- Agree

Explanation statement 1: There is a statutory minimum wage in Belgium. Employers are not allowed to pay a lower wage than the minimum wage.

Statement 2: The government has to provide an income for people who cannot provide

income for themselves.

- Disagree
- No opinion
- Agree

Explanation statement 2: This is the goal of the social security. The goal of social security is to provide an income and/or care for people who, temporarily or permanently, are not able to provide for this themselves. This is for example the case with retirement, sickness or unemployment.

Statement 3: The government has to ensure that incomes are rightfully distributed.

- Disagree
- No opinion
- Agree

Explanation statement 3: The government ensures a redistribution of income based on taxes and benefits. People with a low income keep a higher share of their wage and receive more benefits, such that they can cover all necessary expenses. People with a higher income pay higher contributions in order to finance this.

Statement 4: The largest group of immigrants in Belgium comes from the European Union.

- Disagree
- No opinion
- Agree

Explanation statement 4: This is correct. In 2016, there were 1,812,409 inhabitants with a non-Belgian nationality in Belgium. More than 800,000 of these immigrants were from the European Union. *[table with overview]*

Statement 5: Income inequality in the United States of America is much larger than in Belgium.

- Disagree
- No opinion
- Agree

Explanation statement 5: This is correct. In the graph below, you can see the Gini coefficient, which is a measure for income inequality: the higher the value of the Gini coefficient, the higher the inequality. Income inequality is very high in the United States. *[graph]*

Statement 6: Due to ageing of the population, our social security will become too expensive.

- Disagree
- No opinion

- Agree

Explanation statement 6: The costs of pensions, health care and elderly care are increasing. But other government expenses will decrease: for example, unemployment benefits, child benefits, benefits in the case of sickness. However, financing the pensions will not be easy. Overall, the ageing of the population increases social expenditures in the long-term from 25.2% of the gross domestic product (GDP) to 27.6% of the GDP. In 2070, an additional 2.4% of the GDP will thus be needed to cover the cost of ageing. This is the budgetary cost of ageing.

Statement 7: In the future, we will need to work until a higher age.

- Disagree
- No opinion
- Agree

Explanation statement 7: This is needed in order to pay pensions: working longer means to contribute for a longer period and to receive retirement benefits for a shorter period. Currently, the legal retirement age is 65 years. From 2040, you will only be able to retire with 67 years.

Statement 8: Due to immigration, it is harder for Belgian employees to find a job.

- Disagree
- No opinion
- Agree

Explanation statement 8: Research shows that immigration has no impact on unemployment: immigrants also consume, which creates jobs. There are bottleneck professions for which no employees can be found. European research show, however, that immigration does not have any effects on unemployment. Immigrants are also consumers. Therefore, more needs to be produced, which, in turn, is creating additional jobs. Moreover, immigrants create employment since they are more likely to work as self-employed entrepreneurs than people who are born here.

Statement 9: The unemployment rate among migrants in Belgium is much higher than the unemployment rate among Belgians.

- Disagree
- No opinion
- Agree

Explanation statement 9: This is correct: The unemployment among immigrants is a big problem in Belgium. Data from the OECD from 2017 show that 6% of the working population that is born in Belgium, is unemployed. In the same year, 13% of the working population not born in Belgium is unemployed. These numbers hide large differences between Flanders, Wallonia and Brussels, and also by origin of the migrants.

Statement 10: Migrants can help to solve the problem of an ageing population.

- Disagree
- No opinion
- Agree

Explanation statement 10: Yes, because the migrants that come to our country are young: between 25 and 34 years. Immigrants hence enlarge the group of young people in the overall population. If they find work, they also pay contributions to social security and can help to decrease the burden of pension costs. *[graph that shows age of immigrants]*

Statement 11: Migrants have more rights than native Belgians.

- Disagree
- No opinion
- Agree

Explanation statement 11: This is not true. An immigrant has the same rights as the average Flemish person. If migrants would like to receive social benefits, they need to meet the same requirements as native Belgians. Just as the rest of the population, an immigrant can only receive unemployment benefits after working for 1.5 years. The rights to receive retirement benefits also need to be built up in this country. Example: a retired Syrian who arrives in Belgium cannot receive a pension from the Belgian state.

How long did the discussion game take (minutes)? ____

On the next page, you can compare the opinions of your class with those of other classes! Then students will proceed to the quiz (link). On the last page of the quiz, students receive a code that is necessary to reach the final destination of the urban trail.

## Tutoring Class Treatment 2 (Parent-led Treatment)

Students in the parent-led treatment received a handout from their teacher with the instruction to complete the discussion game (tutoring class) as a homework task with (one of) their parents, and two links to the material provided below, one for students and one for parents. The link for students contained the homework task as well as the midline test ('quiz'), which followed after the completion of the discussion. The link for parents contained the information for parents needed for the task, as well as the parent posttest which followed after the homework task.

### Tutoring Class Treatment 2 (Parent-led Treatment): Homework for Student

*Homework: Discussion Game With (one of) Your Parents*

You are following classes with an urban trail about the role of the government on the

labour market, social security, migration and income inequality. You now arrived at the homework. Do not skip this stop! At the end of the urban trail, you will need a code to reach the last destination. This code is written on the last page of this homework.

You will complete this homework together with (one of) your parents, or another care taker.

Complete the homework carefully in order to finish the urban trail!

You will fill in this questionnaire while your parent is working in a second questionnaire (link). You need to fill in the questionnaires at the same time. This is easiest when using two different devices. The questionnaires can be filled in on a smartphone, tablet or computer with internet connection. If you only have one device that you can use, you can work with two windows or tabs.

In this homework you play a discussion game, together with (one of) your parents. After this game, you and your parent will fill in a short quiz. After filling in the quiz, you will receive the code that you need in the last step of the urban trail. On the last page, you can view the correct answers and your score. You can also compare your answers with those of other students.

*[identification data]*

In this discussion game, you will discuss 11 different statement with your parent.

The game works as follows:

1. One of your will read the statement. The statements appear alternating in this questionnaire and the one for your parent (link).
2. Each of you will say what they think about this statement.
3. You decide together if you agree with the statement.
4. Then you read the explanation together. Discuss if everyone understands the explanations.

On the last page you can compare your answers with those of other families (anonymously).

Are you ready to start? Is your parent ready with the questionnaire for parents (link)? Click on 'next' to start the discussion game!

Statement 1: The government has to set a statutory minimum wage.

- Disagree
- No opinion
- Agree

Explanation statement 1: There is a statutory minimum wage in Belgium. Employers are not allowed to pay a lower wage than the minimum wage.

*Your parent will now read the next statement. Then it is your turn again.*

Statement 3: The government has to ensure that incomes are rightfully distributed.

- Disagree
- No opinion
- Agree

Explanation statement 3: The government ensures a redistribution of income based on taxes and benefits. People with a low income keep a higher share of their wage and receive more benefits, such that they can cover all necessary expenses. People with a higher income pay higher contributions in order to finance this.

*Your parent will now read the next statement. Then it is your turn again.*

Statement 5: Income inequality in the United States of America is much larger than in Belgium.

- Disagree
- No opinion
- Agree

Explanation statement 5: This is correct. In the graph below, you can see the Gini coefficient, which is a measure for income inequality: the higher the value of the Gini coefficient, the higher the inequality. Income inequality is very high in the United States. *[graph]*

*Your parent will now read the next statement. Then it is your turn again.*

Statement 7: In the future, we will need to work until a higher age.

- Disagree
- No opinion
- Agree

Explanation statement 7: This is needed in order to pay pensions: working longer means to contribute for a longer period and to receive retirement benefits for a shorter period. Currently, the legal retirement age is 65 years. From 2040, you will only be able to retire with 67 years.

*Your parent will now read the next statement. Then it is your turn again.*

Statement 9: The unemployment rate among migrants in Belgium is much higher than the unemployment rate among Belgians.

- Disagree
- No opinion
- Agree

Explanation statement 9: This is correct: The unemployment among immigrants is a big problem in Belgium. Data from the OECD from 2017 show that 6% of the working population that is born in Belgium, is unemployed. In the same year, 13% of the working

population not born in Belgium is unemployed. These numbers hide large differences between Flanders, Wallonia and Brussels, and also by origin of the migrants.

*Your parent will now read the next statement. Then it is your turn again.*

Statement 11: Migrants have more rights than native Belgians.

- Disagree
- No opinion
- Agree

Explanation statement 11: This is not true. An immigrant has the same rights as the average Flemish person. If migrants would like to receive social benefits, they need to meet the same requirements as native Belgians. Just as the rest of the population, an immigrant can only receive unemployment benefits after working for 1.5 years. The rights to receive retirement benefits also need to be built up in this country. Example: a retired Syrian who arrives in Belgium cannot receive a pension from the Belgian state.

How long did the discussion game take (minutes)? ____

Now, it's time for the quiz! You will do this alone, without help from your parent. Your parent will fill in the questionnaire for parents. Then, you will receive the first part of the code that is needed for the last step in the urban trail. The second part is written at the end of the parent questionnaire. Ask your parent for the second part of the code!

*[midline test]*

**Tutoring Class Treatment 2 (Parent-led Treatment): Questionnaire for Parent**

*Homework: Instructions for Parents*

The class of your child is participating in a financial literacy project with a course about the role of the government on the labour market, social security, migration and income inequality. This homework is an important part of this course. Students complete this homework task together with (one of) their parents, or another care taker.

For the homework, you will fill in this questionnaire, while your child is working in a second questionnaire (link). You need to fill in the questionnaires at the same time. This is easiest when using two different devices. The questionnaires can be filled in on a smartphone, tablet or computer with internet connection. If you only have one device that you can use, you can work with two windows or tabs.

In this homework you play a discussion game, together with your child. After this game, you will fill in a short survey. On the last page, you will receive the code that your child will need for the next class.

How much do you remember from economics classes in high school? When answering the six knowledge questions in the survey at the end, you will receive the result. On the

last page, you can view the correct answers and your score. You can also compare your answers with those of other parents (anonymously).

*[identification data]*

In this discussion game, you will discuss 11 different statement with your child.

The game works as follows:

1. The statements appear alternating in this questionnaire and the one for your child (link).
2. Each of you will say what they think about this statement.
3. You decide together if you agree with the statement.
4. Then you read the explanation together. Discuss if everyone understands the explanations.

Your child will now start with reading statement 1 in the questionnaire for students (link). Then you will continue with statement 2 on the next page.

Read the statement. Discuss with your child what each of you thinks about it. After the discussion, you will decide if you agree with the statement, as a family. On the last page you can compare your answers with those of other families.

Statement 2: The government has to provide an income for people who cannot provide income for themselves.

- Disagree
- No opinion
- Agree

Explanation statement 2: This is the goal of the social security. The goal of social security is to provide an income and/or care for people who, temporarily or permanently, are not able to provide for this themselves. This is for example the case with retirement, sickness or unemployment.

Statement 4: The largest group of immigrants in Belgium comes from the European Union.

- Disagree
- No opinion
- Agree

Explanation statement 4: This is correct. In 2016, there were 1,812,409 inhabitants with a non-Belgian nationality in Belgium. More than 800,000 of these immigrants were from the European Union. *[table with overview]*

Statement 6: Due to ageing of the population, our social security will become too expensive.

- Disagree
- No opinion

- Agree

Explanation statement 6: The costs of pensions, health care and elderly care are increasing. But other government expenses will decrease: for example, unemployment benefits, child benefits, benefits in the case of sickness. However, financing the pensions will not be easy. Overall, the ageing of the population increases social expenditures in the long-term from 25.2% of the gross domestic product (GDP) to 27.6% of the GDP. In 2070, an additional 2.4% of the GDP will thus be needed to cover the cost of ageing. This is the budgetary cost of ageing.

Statement 8: Due to immigration, it is harder for Belgian employees to find a job.

- Disagree
- No opinion
- Agree

Explanation statement 8: Research shows that immigration has no impact on unemployment: immigrants also consume, which creates jobs. There are bottleneck professions for which no employees can be found. European research show, however, that immigration does not have any effects on unemployment. Immigrants are also consumers. Therefore, more needs to be produced, which, in turn, is creating additional jobs. Moreover, immigrants create employment since they are more likely to work as self-employed entrepreneurs than people who are born here.

Statement 10: Migrants can help to solve the problem of an ageing population.

- Disagree
- No opinion
- Agree

Explanation statement 10: Yes, because the migrants that come to our country are young: between 25 and 34 years. Immigrants hence enlarge the group of young people in the overall population. If they find work, they also pay contributions to social security and can help to decrease the burden of pension costs. *[graph that shows age of immigrants]*

Your child is reading the last statement. Do not close this window. It is important that you will in the short survey on the next page. At the end of this survey, you will receive a code that your child will need in the next class.

*[Parent posttest]*

Give this code to your child. Your child will need the code in the next class.

*[code]*

This is the second part of the code. The first part of the code is written at the end of the questionnaire for students.

Thank you for your participation!

# Appendix D: Questionnaires

## Student Test Questions

Students in all experimental groups completed the pretest shown below before the start of the intervention. Students in both treatment groups completed a midline test, shown in the second subsection, after the discussion class. At the end of the intervention, students of all experimental groups completed the posttest shown in the third subsection. The questions of the posttest were the same in both treatment groups and the control group, with exception of the questions about the course, at the end of the questionnaire. The second posttest shown in the last subsection was given only to students in the two treatment groups.

### Pretest

*[Questions about student characteristics: track, grade year, grade repetition, Dutch and math grades, language spoken at home, country of birth of student and parents, socioeconomic status (travel), owning, bank account, economic possessions, mother's education]*

Family communication frequency 1/5 *[Less than once a month, 1-2 times per month, Once a week, 3 times per week, More than 3 times per week]*: How often do you speak with your parents about politics, news, elections or social issues?

Parents help with homework 1/5 *[Less than once a month, 1-2 times per month, Once a week, 3 times per week, More than 3 times per week]*: How often do your parents help you with homework?

Family conversation orientation 1/5 *[Completely Disagree, Disagree, No opinion, Agree, Completely Agree]*:

- I can tell my parents almost anything.
- My parents like to hear my opinions, even when they don't agree with me.
- My parents tend to be very open about their financial situation.
- In our family we often talk about our plans and hopes for the future and how to afford them.

Family conformity 1/5 *[Completely Disagree, Disagree, No opinion, Agree, Completely Agree]*: I often agree with my parents, for example, when we talk about politics or social issues.

Values financial education 1/5 *[Completely Disagree, Disagree, No opinion, Agree, Completely Agree]*: I find it important to know about financial topics, such as savings and means of payments.

Self-assessment: financial knowledge 1/5 *[Completely Disagree, Disagree, No opinion, Agree, Completely Agree]*: I consider myself to have a good knowledge of financial topics, such as

savings, costs and means of payment.

Values economic education 1/5 *[Completely Disagree, Disagree, No opinion, Agree, Completely Agree]*: I find it important to know about the labour market, social security, migration and income inequality.

Self-assessment: economic knowledge 1/5 *[Completely Disagree, Disagree, No opinion, Agree, Completely Agree]*: I consider myself to have a good knowledge of the labour market, social security, migration and income inequality.

Self-assessment: migration 0/3 *[I have never heard about this, I have heard about this but I cannot explain what it means, I know something about it and I could explain the general issue, I know about it and I could explain it well]*: To which extent are you informed about migration (movement of people)?

*Knowledge Score 0/10*

1. Which of the following statements is correct?
    - Everyone who works receives the same wage.
    - A worker in a car factory will receive the same wage as a worker in a cookie factory.
    - An employer can agree with her employees to pay a lower wage than the statutory minimum wage.
    - Trade unions and employer organisations make agreements that set the wages for the different types of work. X
    - I don't know the answer.
2. A vacancy is a job for which an employee is being searched for. When there are more people looking for a job than there are vacancies, there is unemployment.
    - Correct X
    - Wrong
    - I don't know the answer.
3. What is a bottleneck profession?
    - A job that will disappear in the future.
    - A job for which there are not enough candidates. X
    - A job for which there are too many candidates.
    - I don't know the answer.
4. Which of the following statements is correct?
    - Everyone who works, has to pay contributions to social security. X
    - In our country, you can choose to contribute to social security, but if you do not choose to do so, you will not receive unemployment benefits or a pension.
    - Everyone who works pays the same fixed amount to social security.
    - Self-employed people do not pay contributions to social security.
    - I don't know the answer.
5. Which of the following incomes is a replacement income?

- Child benefits
- Patient contribution (term for the money paid at the doctor in Belgium)
- Unemployment benefits X
- Wage
- Interest on a savings account
- I don't know the answer.

6. Which of the following is not part of the social security?
   - Child benefits
   - Pensions
   - Taxes X
   - Unemployment benefits
   - I don't know the answer.
7. When people leave their country to go live in another country, this is called:
   - Migration balance
   - Immigration
   - Emigration X
   - Transmigration
   - I don't know the answer.
8. What is the ageing of the population?
   - People are getting older.
   - The share of +67-year old people in the overall population increases. X
   - There are more +67-year old people.
   - All of these options are correct.
   - I don't know the answer.
9. In our country, the tax rate is higher for people who earn more money than for people who earn less money. Which statement is correct in this case?
   - Income inequality increases when people have to pay taxes.
   - Income inequality decreases when people have to pay taxes. X
   - Income inequality remains the same when people have to pay taxes.
   - I don't know the answer.
10. Which of the following statements is correct?
    - Social security increases income inequality.
    - Social security has no impact on income inequality.
    - Social security decreases income inequality. X
    - I don't know the answer.

*Financial Literacy Score 0/3*

1. When an investor is investing in different investment products instead of focusing on one single investment product, then this has the following effect on his risk:
   - His risk decreases. X
   - His risk increases.

- His risk remains the same.
- I don't know the answer.

2. You are opening a savings account and depositing €100. The interest rate is 1% per year. The inflation is 2% per year. After one year you can buy with the amount on the account:
   - More than today
   - Less than today X
   - The same as today
   - I don't know the answer.
3. You are opening a savings account and depositing €100. The interest rate is 2% per year. How much money is on the account after five years if you do not deposit more or withdraw anything?
   - Less than €110
   - Exactly €11
   - More than €110 X
   - I don't know the answer.

Confidence about answers 1/5 [*Not confident at all, Not confident, No opinion, Confident, Very Confident*]: How confident are you in general about all your answers?

**Midline Test**

*Targeted Knowledge Score 0/5*

1. In Belgium, there is a minimum wage:
   - Only for holiday jobs
   - For all employees X
   - Only for employees with a physically challenging profession
   - Only for older employees
   - Only for public servants
   - I don't know the answer.
2. Which statement is correct?
   - Due to the ageing of the population, the government expenses for pensions increase. X
   - Due to the ageing of the population, the government expenses for unemployment benefits increase.
   - Due to the ageing of the population, the government expenses for child benefits increase.
   - I don't know the answer.
3. At which age will you be able to retire after 2030?
   - 63 years
   - 65 years

- 67 years X
- 69 years
- I don't know the answer.

4. From which countries comes the majority of immigrants in Belgium?
    - Countries in war zones, such as Afghanistan, Iraq, Syria, ...
    - Countries of the European Union, such as Poland, Romania, Portugal, ... X
    - Morocco and Tunisia
    - China
    - I don't know the answer.
5. Which statement is correct?
    - Migrants that only arrive here when they are retired receive retirement payments from the Belgian government.
    - The unemployment rate among immigrants is equal to the unemployment rate among Belgians.
    - Immigrants that work in Belgium pay social security contributions. X
    - All of the above answers are correct.
    - I don't know the answer.

Write down this code to reach the last step of the urban trail in your next class: *[code]*

On the next page, you can see the correct answers and your score. Then, you can compare your answers with those of other students.

**Posttest**

*Targeted Knowledge Score 0/5*

1. If the employees agree, can the employer pay them a wage lower than the minimum wage?
    - Yes, as long as there is an oral agreement.
    - Yes, as long as there is a written agreement.
    - No, the wage can never be lower than the minimum wage. X
    - I don't know the answer.
2. Which statement is correct?
    - The costs of our social security will become easier to cover in the future.
    - The costs of our social security will become harder to cover in the future. X
    - The costs of our social security will be as easy/difficult to cover in the future as nowadays.
    - I don't know the answer.
3. Why did the government decide to increase the retirement age?
    - Because there are less and less working people per retired person. X
    - Because there are more and more working people per retired person.

- Because there are many bottleneck professions.
- I don't know the answer.

4. The largest group of immigrants in Belgium comes from Africa.
    - Correct
    - Wrong X
    - I don't know the answer.
5. Which statement is correct?
    - Migrants receive child benefits for their children who still live in their country of origin.
    - The unemployment rate among migrants is higher than the unemployment rate among Belgians. X
    - Due to immigration it is more difficult for Belgian employees to find a job.
    - All of these options are correct.
    - I don't know the answer.

*Knowledge Score 0/10*

1. Which statement is correct?
    - A worker that works in shifts, earns the same as a worker who only works during the day.
    - Women who do the exact same job as men, have to receive the same wage. X
    - A worker in the construction sector has to receive the same wage as a worker in a food factory.
    - Everyone who works receives the same wage.
    - I don't know the answer.
2. If there are more vacancies than people searching for work, there is unemployment.
    - Correct
    - Wrong X
    - I don't know the answer.
3. If you follow training that prepares for a bottleneck profession, then
    - It will be difficult to find a job.
    - You will find a job for sure. X
    - You will only find a job if you are a woman.
    - I don't know the answer.
4. The social security of employees is being paid for by
    - Contributions of the employees only.
    - Contributions of the employers only.
    - A fixed sum from the federal government.
    - Contributions of employees and employers and a fixed sum from the federal government. X
    - Contributions of the employees and employers.
    - I don't know the answer.

5. Which of the following incomes is an additional income from the social security?
    - Child benefits X
    - Pensions
    - Unemployment benefits
    - Wage
    - Rent that you receive from a house that you rent
    - I don't know the answer.
6. Which of the following is not part of the social security?
    - Child benefits
    - Pensions
    - Wage X
    - Unemployment benefits
    - I don't know the answer.
7. When people from another country come to live in our country, this is called:
    - Migration balance
    - Immigration X
    - Emigration
    - Transmigration
    - I don't know the answer.
8. What is the ageing of the population?
    - There are less young people.
    - There are more +67-year old people.
    - The share of +67-year old people in the overall population increases. X
    - All of these options are correct.
    - I don't know the answer.
9. In our country, people pay taxes and social contributions, and people receive benefits from the social security. This results in:
    - A decrease in income inequality X
    - An increase in income inequality
    - Income inequality remaining the same
    - I don't know the answer.
10. Which of the following statements is correct?
    - The goal of social security is to provide an income and/or care for people who are temporarily not able to provide for this themselves. X
    - Our social security is based on voluntary participation.
    - Social security and social assistance are synonyms.
    - I don't know the answer.

*Financial Literacy Score 0/3*

1. Investor A has a certain amount invested in shares of a company. Investor B has invested the same amount but spread over shares of different companies. For which

investor is the risk the highest?
   - Investor A X
   - Investor B
   - The risk is the same
   - I don't know the answer.
2. You are opening a savings account and depositing €50. The interest rate is 2% per year. The inflation is 1% per year. After one year you can buy with the amount on the account:
   - More than today X
   - Less than today
   - The same as today
   - I don't know the answer.
3. You are opening a savings account and depositing €200. The interest rate is 2% per year. How much money is on the account after five years if you do not deposit more or withdraw anything?
   - Less than €220
   - Exactly €220
   - More than €220 X
   - I don't know the answer.

Confidence about answers 1/5 (see pretest)

*Only in both treatment groups:*

Did you work alone at a computer during the classes? [*I worked alone, I worked with one other student, I worked with two other students, I worked with more than two other students*]

How were the classes of the course planned in your class? [*All classes were on the same day, The classes were on different days in one week, The classes were spread over several weeks, I don't remember*]

*Only Teacher-led Treatment:*

Did you play the discussion game with your class? [*Yes, No, I don't remember, I played the discussion game but not with the whole class.*]

*Only Parent-led Treatment:*

Did you do the homework with your parents (discussion game)? [*Yes, No, I don't remember, I did the homework but not with my parents.*]

**Second Posttest**

Targeted Knowledge Score 0/5

1. Can an employer exceptionally pay a wage that is lower than the minimum wage?

- Yes, for holiday jobs.
- Yes, as long as there is a written agreement.
- No, the wage can never be lower than the minimum wage. X
- I don't know the answer.

2. Which statement is correct?
   - Due to the ageing of the population, the government expenses for unemployment benefits increase.
   - Due to the ageing of the population, the government expenses for health increase. X
   - Due to the ageing of the population, the government expenses for education increase.
   - I don't know the answer.
3. Which statement is correct?
   - From 2030, you can retire in Flanders at a younger age than nowadays.
   - From 2030, you can retire in Flanders only at an older age than nowadays. X
   - There will be no change in retirement age.
   - I don't know the answer.
4. From which countries comes the majority of immigrants in Belgium?
   - Countries of the European Union, such as Poland, Romania, Portugal, ... X
   - Syria and Iraq
   - Morocco and Turkey
   - I don't know the answer.
5. Which statement is correct?
   - The unemployment rate among immigrants is lower than the unemployment rate among Belgians.
   - Due to immigration, it is harder for Belgian employees to find a job.
   - Immigrants who work in Belgium pay social security contributions. X
   - All of the above answers are correct.
   - I don't know the answer.

### Parent Questionnaires

Parents in all experimental groups received the pretest shown below before the start of the intervention. Parents in the control group and the teacher-led treatment received the posttest shown in the following section at the end of the intervention. Parents in the parent-led treatment received the same posttest at the end of the discussion class which was given as homework assignment.

**Parent Pretest**

We would like to emphasize that there are no correct or wrong answers to the following attitude questions. We are interested in your spontaneous opinions. Pick the answer that best reflects your personal opinion.

Values economic education 1/5 *[Completely Disagree, Disagree, No opinion, Agree, Completely Agree]*: Knowledge about the labour market, social security, migration and income inequality will be useful for my child.

Self-assessment: economic knowledge 1/5 *[Completely Disagree, Disagree, No opinion, Agree, Completely Agree]*: I consider myself to have a good knowledge of the labour market, social security, migration and income inequality.

Interested in school work 1/5 *[Completely Disagree, Disagree, No opinion, Agree, Completely Agree]*: I like knowing what my child is learning at school.

Enjoys helping with school work 1/5 *[Completely Disagree, Disagree, No opinion, Agree, Completely Agree]*: I like helping my child with school work.

Family communication frequency 1/5 *[Less than once a month, 1-2 times per month, Once a week, 3 times per week, More than 3 times per week]*: How often do you speak with your child about politics, news, elections or social issues?

Helps with homework 1/5 *[Less than once a month, 1-2 times per month, Once a week, 3 times per week, More than 3 times per week]*: How often do you help your child with homework?

Family conformity 1/5 *[Completely Disagree, Disagree, No opinion, Agree, Completely Agree]*: I often agree with the opinion of my child, for example, when we speak about politics or social issues.

Family openness 1/5 *[Completely Disagree, Disagree, No opinion, Agree, Completely Agree]*: My child is able to influence my ideas about specific issues.

Self-assessment: migration 0/3 *[I have never heard about this, I have heard about this but I cannot explain what it means, I know something about it and I could explain the general issue, I know about it and I could explain it well]*: To which extent are you informed about migration (movement of people)?

*Knowledge Score 0/6*

1. When people leave their country to go live in another country, this is called:
    - Migration balance
    - Immigration
    - Emigration X
    - Transmigration
    - I don't know the answer.

2. From which part of the world comes the majority of immigrants in Belgium?
    - From Europe X
    - From Asia
    - From Africa
    - From North- and South America
    - I don't know the answer.
3. What is the ageing of the population?
    - People are getting older.
    - The share of +67-year old people in the overall population is increasing. X
    - There is an increasing number of +67-year old people.
    - All of these options are correct.
    - I don't know the answer.
4. What is the goal of social security in Belgium?
    - To let everyone earn more money
    - To provide an income and care for those who cannot provide this for themselves X
    - Provide for a good pension
    - I don't know the answer.
5. Which statement is correct?
    - Social security increases income inequality.
    - Social security does not influence income inequality.
    - Social security decreases income inequality. X
    - I don't know the answer.
6. In our country, tax rates are higher for people who earn more than for people who earn less. Which statement applies in that case?
    - Income inequality increases when people need to pay taxes.
    - Income inequality decreases when people need to pay taxes. X
    - Income inequality remains the same when people need to pay taxes.
    - I don't know the answer.

Thank you for your participation!

**Parent Posttest**

Some questions are similar to those of the first questionnaire, but it is important for the research that you answer these questions again.

We would like to emphasize that there are no correct or wrong answers to the following attitude questions. We are interested in your spontaneous opinions. Pick the answer that best reflects your personal opinion.

Family Communication frequency 0/3 [*Not, Once, Twice, More than twice, I did not fill in*

*the previous questionnaire*]: How often did you speak to your child about politics, news, elections or social issues, since the first questionnaire?

*Knowledge Score 0/6* How much do you remember from your economics classes in high school? Answer these knowledge questions, and you will know. At the end of this questionnaire, you can see the correct solutions and your score. You can also anonymously compare your answers to those of other parents.

1. In Belgium, there is a minimum wage:
    - Only for holiday jobs
    - For all employees X
    - Only for employees with a physically challenging profession
    - Only for older employees
    - Only for public servants
    - I don't know the answer.
2. From which countries comes the majority of immigrants in Belgium?
    - Countries in war zones, such as Afghanistan, Iraq, Syria, ...
    - Countries of the European Union, such as Poland, Romania, Portugal, ... X
    - Morocco and Tunisia
    - China
    - I don't know the answer.
3. Which statement is correct?
    - Due to the ageing of the population, the government expenses for pensions increase. X
    - Due to the ageing of the population, the government expenses for unemployment benefits increase.
    - Due to the ageing of the population, the government expenses for child benefits increase.
    - I don't know the answer.
4. At which age will you be able to retire after 2030?
    - 63 years
    - 65 years
    - 67 years X
    - 69 years
    - I don't know the answer.
5. Which statement is correct?
    - Migrants that only arrive here when they are retired receive retirement payments from the Belgian government.
    - The unemployment rate among immigrants is equal to the unemployment rate among Belgians. X
    - Immigrants that work in Belgium pay social security contributions.
    - All of the above answers are correct.

    - I don't know the answer.
6. In our country, people pay taxes and social contributions, and people receive benefits from the social security. This results in:
    - A decrease in income inequality X
    - An increase in income inequality
    - Income inequality remaining the same
    - I don't know the answer.

If you filled in the first questionnaire, you can skip the following questions.

Education 0/2 (see parent pretest)

Family communication frequency 1/5 (see parent pretest)

Helps with homework 1/5 (see parent pretest)

Thank you for your participation!

## Teacher Questionnaires

Teachers in all experimental groups received a short survey at the start of the intervention, in order to collect baseline teacher characteristics. At the end of the intervention, teachers in both treatment groups received a short survey about the implementation of the course.

### First Teacher Questionnaires

*[Teacher background characteristics]*

### Second Teacher Questionnaire

How were the classes of the course planned for this class? [*All classes were on the same day, The classes were on different days in one week, The classes were spread over several weeks, I don't remember*]

How did you form the groups of students that worked together on a computer? [*Randomly, Based on their grades, Based on their interest, Students could choose their group, Students were working individually, I don't remember*]

*Only Teacher-led Treatment:*

Did you play the discussion game with this class? [*Yes in the third class period, No, Yes but in another class period*]

Did you give students the quiz after the discussion game? [*Yes in the third class period, Yes but as homework, No, Yes but in another class period*]

How long did the discussion take? (minutes) ___

*Only Parent-led Treatment:*

There was a homework task that students were supposed to do with their parents. Did you give this to the students of this class? [*Yes after the second class, No, I don't remember, Yes but in another class period*]