

Studying at home: worth it?

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Homework time and its effect on students' academic achievement is a relevant subject with worldwide repercussion. Nevertheless, although transcendental, this issue has been studied for primary education mostly by correlational studies and their results are somewhat mixed. The current research aims at contributing to this literature by using a student fixed-effects approach to study the relationship between homework time and students' academic achievement across 24 countries. We argue that this procedure let us get closer to causal estimates – compared to much of the existing literature – by capturing differences in homework time amongst the same student across different school subjects. Our main results show that the amount of time that primary school children devote to homework is

not related to their academic achievement in that subject. This result is held across all the analysed countries and robustness checks. Hence, this may indicate that the quality of the homework assigned to primary school pupils may not be enough, so it should be improved to help students' make a better use of their time.

Keywords: homework time; student fixed-effects; PIRLS; TIMSS; Spain.

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INTRODUCTION

Homework has been considered by teachers and educators as one of the main mechanisms to continue students' learning when they are not at school. Authors like Corno and Xu (2004) defined homework as the “job of childhood” to the extent that it develops students' responsibility and attitude, preparing them for their future work. However, in spite of its apparent positive effect on students' academic achievement, homework has become one of the main causes of problems between schools and parents (Cooper, 2001) due to the – sometimes – excessive amount of it that students are assigned at early ages. This situation has reached to the point that, as e.g., Spanish parents have considered their children to be “losing their childhood”¹. This has driven parental organizations, particularly, the Spanish Confederation of Fathers' and Mothers' Associations (*Confederación Española de Asociaciones de Padres y Madres*, CEAPA) to initiate “homework strikes”, such as that in November 2016². These mobilisations against homework are not a practice which is exclusive for this country, as recent homework research has encouraged teachers and schools to reduce or even eliminate homework in primary education classes around the world³.

In this international context of the homework debate, the existing heterogeneity in the amount of homework that countries give to children and its association with academic achievement denote how important is to analyse homework in the particular case of each country. This heterogeneity can be quickly spotted when taking a look at the PISA 2012 data (OECD, 2014a; 2014b): countries as, e.g., Finland, which present a reduced amount of homework, are amongst the highest performers in PISA 2012. Nevertheless, other countries like Hong-Kong or Singapore – two of the highest performers – present a positive high correlation of homework with academic achievement. Hence, the literature is mainly split into those works which highlight the existence of a positive association between homework and academic achievement and those which state that this effect is weak or null.

Within the “positive-effect” strand of the literature, Cooper, Robinson, and Patall (2006) performed a comprehensive meta-analysis on the effect of homework on students' academic achievement focused on research from the United States in the years 1987 to 2003. They found that there is a positive correlation between homework and students' academic achievement, but there is not any evidence on the association of this effect and the outcome measure (grades or standardised tests) or the subject (reading or mathematics). Dettmers, Trautwein, and Lüdtke (2009) studied the relationship between homework and academic achievement in mathematics using data from 40 countries which participated in PISA 2003, finding a positive relationship between homework and academic achievement in most of those countries. With similar results, Trautwein (2007) analysed PISA data (2000) for an extended

¹ Referred article in the Spanish newspaper “*El país*”:

https://elpais.com/elpais/2016/11/03/inenglish/1478172531_599502.html

² Referred article in “The guardian” newspaper: <https://www.theguardian.com/world/2016/nov/02/spanish-parents-urged-to-put-children-on-weekend-homework-strike>

³ Some examples in Dailymail Online: <http://www.dailymail.co.uk/wires/ap/article-3807263/Goodbye-homework-elementary-schools-classes.html>

German sample and found that homework assignments are positively associated with achievement when using homework frequency and effort variables, but that homework time does not seem to affect achievement gains. This homework issue was also studied by Murillo and Martinez-Garrido (2014) for primary education students in 16 Latin American countries, finding also that homework time is relevant, but only when incorporated into classroom dynamics in the case that teachers build on them for their classes and correct it. Other authors such as Falch and Rønning (2012) studied the effect of homework frequency on primary education students' academic achievement in 16 countries, finding that it has a significant positive effect which ranges from 4 to 21 standard deviations, depending on the country. Hence, there is much evidence which highlights a positive relationship between homework and students' academic achievement, but getting a causal effect is much more difficult.

On the other strand of the homework debate, authors as Baş, Şentürk, and Ciğerci (2017) performed a meta-analysis on homework assignments and their effect on students' academic achievement, finding an effect size of 0.229, what denoted that its effect is very small. As highlighted by Trautwein and Köller (2003), who performed a review of twentieth-century review on homework, in spite of the long list of research on this issue, the empirical evidence on the positive effect of homework on students' academic achievement is weak. In this issue, the UK Education Endowment Foundation has reported that "A number of reviews and meta-analyses have explored this issue. There is stronger evidence that it is helpful at secondary level, but there is much less evidence of benefit at primary level"⁴. Kohn (2006) also supported this argument, indicating that there are very few researches which show that homework benefits students' academic achievement in primary school; he also indicated that homework studies have many limitations, being the most relevant that they show only association between homework and academic achievement, rely on students' self-reported homework time and the confusion between the outcome being measured: scores obtained in tests designed by teachers or standardised test scores. Working on this latter argument on the homework effect conditioned on the grade students are taking, the current research aims to explore this homework time issue for primary education students.

To perform this research we make use of the rich information on homework provided by the Progress in International Reading Literacy Study (PIRLS) 2011 and the Trends in International Mathematics and Science Study (TIMSS) 2011. These databases offer us information on the assigned homework time reported by teachers for their students in three different subjects – reading, mathematics and science – which let us use student fixed effects within-students between-students to get the effect of homework time on students' academic achievement. This strategy has been used to study homework for secondary education students at the United States (Eren & Henderson, 2011) or by Falch and Rønning (2012) for primary education students in 16 countries which participated in TIMSS 2007 (so they used only mathematics and science information; in addition, they focused on homework frequency and not on homework time).

⁴ More information about the research on homework time from this group can be found in: <https://educationendowmentfoundation.org.uk/evidence-summaries/teaching-learning-toolkit/homework-primary>

The rest of the paper is structured as follows: first, the data and methodology employed for this analysis are described. After that, the main results and robustness checks are presented, ending with a conclusion section.

DATA

Our analysis focuses on those students who participated both in PIRLS 2011 and TIMSS 2011, which are organized by the International Association for the Evaluation of Educational Achievement (IEA). The aim of TIMSS is to report fourth (aged 9-10) and eighth grade (aged 13-14) students' achievement in mathematics and science (Mullis, Martin, Foy, & Arora, 2012; Martin, Mullis, Foy, & Stanco, 2012), while the objective of PIRLS is to provide information about reading literacy achievement of fourth grade students (aged 9-10) for the participating countries (Mullis, Martin, Foy, & Drucker, 2012). A total of 45 countries participated in fourth grade in PIRLS and 50 in fourth grade in TIMSS. The particular advantage of using both PIRLS and TIMSS 2011 is that, in many of these countries, almost all fourth grade students took both PIRLS and TIMSS.

The sampling procedure employed for PIRLS and TIMSS is a two-stage cluster sample design (Martin & Mullis, 2012). In the first stage, schools are sampled using probabilities proportional to their size (PPS). In the second stage, all students in one or more classes of the grade under analysis are selected. Besides from students' academic achievement, PIRLS and TIMSS gathered contextual information with four questionnaires: student, home (only in PIRLS), school and teacher questionnaires.

The use of this database has many advantages: first, it provides information about assigned homework and many homework practices that students are receiving, being these reported directly by the teachers. The latter has the advantage that this measure is less likely to be biased as, e.g., students' self-reported homework time (Kohn, 2006). Although some relevant International Large Scale Assessment tests like PISA 2015 have this teacher information, it is not directly linkable to the student level, but only to school level (OECD, 2017). In addition, linking PIRLS and TIMSS databases let us obtain information for students in the subjects of reading, mathematics and science, which is essential to perform our identification strategy – as described in the methodology section.

The main variable used for this research is that related to the homework time assigned by the teacher (from the teacher background questionnaire; R15 in PIRLS for reading, M9B in TIMSS for mathematics and S8B in TIMSS for science). The wording of this variable is the following⁵:

When you assign (subject) homework to the students in this class, about how many minutes do you usually assign? (Consider the time it would take an average student in your class).

- 15 minutes or less.
- 16-30 minutes.
- 31-60 minutes.
- More than 60 minutes.

⁵ The wording of this variable is not exactly the same in PIRLS, but it is measuring the same as in TIMSS.

In addition, a fifth category [“I do not assign (subject) homework”] is included in this variable, from a previous question⁶.

Regarding to the sample used for this analysis, only common countries in PIRLS and TIMSS were selected, meaning this a total of 37 countries⁷. Five out of these countries (Denmark, England, Netherlands, New Zealand and the United States) do not share a common sample of students for PIRLS and TIMSS, so they were not included⁸. Afterwards, Hong Kong SAR was not included because any of the teachers in PIRLS was in TIMSS. In order to perform the current identification strategy, we kept those students who were taught by the same teacher in the three subjects, what meant that we did not include in our analysis those countries whose sample was highly reduced by this criterion (less than one-third of the common PIRLS and TIMSS sample did not remain). This supposed eliminating Chinese Taipei (only 3.77% of the initial students remained), Italy (10.62%), Morocco (6.05%), Oman (0.94%), Qatar (9.62%), Saudi Arabia (0%) and United Arab Emirates (16.48%)⁹. Finally, those teachers with missing observations in the main homework time variable in any of the three subjects were not included in the analysis. There are some cases in which students were taught by two teachers in the three subjects: in these cases, each teacher was considered as a separate observation, being this last sample used for estimations of the base model – this model is described in the methodology section.

METHODOLOGY

The identification strategy employed in the current research makes use of the heterogeneity in homework time within-students between-subjects to analyse its effect on the variability in students’ academic achievement between-subjects, by the use of student fixed effects. It is important to highlight that PIRLS/TIMSS recommended practices to deal with its data have been applied¹⁰ (Martin & Mullis, 2002) – authors as Jerrim, Lopez-Agudo, Marcenaro-Gutierrez, and Shure (2017) have highlighted the relevance of using the recommended

⁶ This previous question is R14 in PIRLS and M9A and S8A in TIMSS (from the teacher questionnaire): “How often do you usually assign (subject) homework to the students in this class?”, with the options: “I do not assign (subject) homework”, “Less than once a week”, “1 or 2 times a week”, “3 or 4 times a week” and “Every day”.

⁷ These countries are: Australia, Austria, Azerbaijan, Chinese Taipei, Croatia, Czech Republic, Denmark, England, Finland, Georgia, Germany, Hong Kong SAR, Hungary, Iran, Islamic Rep. Of, Ireland, Italy, Lithuania, Malta, Morocco, Netherlands, New Zealand, Northern Ireland, Norway, Oman, Poland, Portugal, Qatar, Romania, Russian Federation, Saudi Arabia, Singapore, Slovak Republic, Slovenia, Spain, Sweden, United Arab Emirates and the United States.

⁸ There is an exception: Spain, which extended its sample in PIRLS for the Autonomous Communities of Andalusia and Canary Islands (a total of 8,580 students), but not in TIMSS (4,183 students). Hence, only the observations of TIMSS were included for this country. This should not drive to sample problems, as the TIMSS’s sample is representative.

⁹ The percentages for the rest of the countries are: Australia (86.79%), Austria (90.69%), Azerbaijan (59.89%), Croatia (100%), Czech Republic (74.83%), Finland (90.84%), Georgia (65.06%), Germany (50.76%), Hungary (54.19%), Iran, Islamic Rep. Of (100%), Ireland (100%), Lithuania (97.67%), Malta (80.93%), Northern Ireland (96.34%), Norway (49.31%), Poland (100%), Portugal (100%), Romania (100%), Russian Federation (96.56%), Singapore (40.13%), Slovak Republic (60.29%), Slovenia (99.26%), Spain (100%) and Sweden (47.84%).

¹⁰ Both PIRLS and TIMSS Jackknife and student weights have been applied, depending on the subject (PIRLS’s weights for reading and TIMSS’s weights for mathematics and science). The main results have been replicated using, alternatively, only PIRLS and TIMSS weights, and results do not change.

practices by the organisers of International Large-Scale Assessment tests. We depart from the initial model:

$$Y_{its} = \alpha + \beta HT_{ts} + \gamma X_{its} + \delta T_{ts} + \varepsilon_{its} \quad (1)$$

where i represents the student, t the teacher and s the school. Y_{its} is students' standardised academic achievement¹¹; HT_{ts} the homework time reported by the teacher; X_{its} student characteristics which are the same within-students between-subjects; T_{ts} teacher characteristics which are the same within-teacher between-subjects.

We estimate the model in (1) by the use of student fixed effects. To do this, we differentiate each variable within-students between-subjects and eliminate sub-indexes, obtaining the following model – our base model, from now on:

$$\Delta Y = \beta \Delta HT + \gamma \Delta X + \delta \Delta T + \Delta \varepsilon \quad (2)$$

These X s are the same within-students, so $\Delta X = 0$. As we are using students taught by the same teacher in the three subjects under analysis, this same happens for these T s, which are the same within-teachers, so $\Delta T = 0$. This let us obtain β , which is the effect of homework time on students' academic achievement, as this homework time varies between subjects.

The current identification strategy relies upon two main pillars: first, the existence of variability in the homework time variable. This variability has been checked for each pair of subjects by country (analysing the cases in which the homework time reported by teachers is different between each pair of subjects), finding that for reading and mathematics between 28% and 70% of teachers reported different homework time (in the categorical homework time variable), with an average for all countries of 48%; in the case reading and science pair, between 44% and 83% reported different homework time (with an average for all countries of 61%); for the pair of mathematics and science, these figures range between 76% and 32%, with an average of 50% for all countries. Hence, it seems that there is an adequate amount of variability in homework time to perform this research.

The second pillar is the assumption that the effect of homework time is the same for the three subjects, i.e., β does not change between-subjects, so students' education production function for homework time is the same for the three subjects. Some authors like Metzler and Woessmann (2012) or Cattaneo, Oggenfuss, and Wolter (2017) – based on the previous ones – proposed to check this by the use of an equality test of the observable and unobservable effects between-subjects of the variable under analysis. We consider that these tests, although being useful, impose many other restrictions – as, e.g., relying on estimations with omitted variables, so we cannot control by every variable explaining students' academic achievement – which are similar or even stronger to the departing one consisting of the effect of β being the same for all subjects. Because of that, we are cautious and stick to interpreting β as the effect of homework time on students' academic achievement, but not as a causal effect.

¹¹ Standardisation has been performed using each country's mean and standard deviation for each subject (Mullis, Martin, Foy, & Drucker, 2012; Mullis, Martin, Foy, & Arora, 2012; Martin, Mullis, Foy, & Stanco, 2012).

Nevertheless, we checked this equality of the homework time effect between subjects in the robustness checks' section by restricting our estimations only to those students who indicated that they like the three subjects at the same level and, alternatively, to those students who are confident at the same level in the three subjects. Additional robustness checks have supported the results obtained by the base model.

RESULTS

Main results

The main results of our analysis are presented in Table 1. The homework time variable has been expressed in a quasi-continuous way and its unit of measurement is a ten-minute change in homework time¹².

Table 1. Effect of assigned homework time on students' academic achievement

Countries	Assigned homework time		Subject: Reading (Ref.: Science)		Subject: Mathematics (Ref.: Science)		Constant		Observations	R-squared
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.		
Australia	-0.004	0.010	-0.001	0.027	0.011	0.030	0.013	0.052	10,407	0.843
Austria	0.019	0.013	-0.001	0.031	-0.026	0.034	-0.033	0.048	11,781	0.810
Azerbaijan	0.016	0.018	-0.052	0.056	0.008	0.024	0.080	0.086	7,956	0.737
Croatia	-0.009	0.010	0.004	0.033	0.008	0.027	0.023	0.038	13,254	0.790
Czech Republic	-0.005	0.013	-0.013	0.027	-0.007	0.021	0.039	0.047	9,813	0.810
Finland	0.017	0.019	-0.023	0.039	-0.009	0.037	-0.031	0.055	11,850	0.775
Georgia	0.024**	0.009	0.003	0.031	-0.009	0.039	-0.045	0.058	8,727	0.825
Germany	0.007	0.017	0.018	0.034	0.001	0.047	-0.048	0.058	5,688	0.812
Hungary	-0.007	0.011	0.009	0.028	0.007	0.030	-0.014	0.075	7,521	0.863
Iran, Islamic Rep. Of	0.002	0.007	0.003	0.022	-0.005	0.018	-0.017	0.039	16,305	0.844
Ireland	0.002	0.017	-0.008	0.033	0.002	0.032	0.015	0.038	12,939	0.823
Lithuania	0.022**	0.010	-0.020	0.026	-0.013	0.018	-0.025	0.044	13,206	0.831
Malta	0.010	0.009	-0.020	0.024	-0.006	0.018	-0.058**	0.028	7,668	0.814
Northern Ireland	0.008	0.009	0.009	0.042	0.001	0.032	0.012	0.043	8,037	0.830
Norway	-0.019	0.015	0.050	0.040	0.050	0.033	0.005	0.059	4,233	0.790
Poland	0.001	0.011	-0.006	0.025	0.003	0.025	0.001	0.039	14,442	0.830
Portugal	-0.003	0.016	0.001	0.033	0.007	0.017	0.007	0.073	11,409	0.806
Romania	-0.014	0.010	0.025	0.039	0.015	0.026	0.042	0.055	13,476	0.847
Russian Federation	0.011	0.014	-0.018	0.031	-0.007	0.026	-0.037	0.065	12,822	0.796
Singapore	-0.004	0.008	-0.019	0.021	0.005	0.015	0.065	0.065	6,939	0.850
Slovak Republic	-0.017	0.018	0.036	0.027	0.002	0.022	0.000	0.071	9,675	0.846
Slovenia	-0.006	0.012	0.002	0.032	-0.001	0.025	0.016	0.038	12,738	0.836
Spain	0.003	0.016	-0.048	0.044	-0.010	0.031	0.004	0.052	10,608	0.806
Sweden	-0.020	0.015	0.007	0.056	0.018	0.038	0.005	0.061	4,680	0.780

Notes: PIRLS/TIMSS recommended practices have been applied, using both PIRLS and TIMSS Jackknife and student weights. The "Assigned homework time" variable is measured in ten-minutes. "Coeff." stands for "Coefficient" and "S.E." for "Standard error". Estimation method: Student fixed effects. Dependent variable: PIRLS/TIMSS standardised five plausible values. Coefficient: ***Significant at 1%, ** significant at 5%, * significant at 10%.

Source: Authors' own calculations.

The obtained results show that it seems that there is not any effect of homework time on students' academic achievement for most of the analysed countries. Particularly, in the cases

¹² Concretely, the homework time variable has been translated into a ten-minute quasi-continuous variable in the following way: "I do not assign (subject) homework" is 0 ten-minutes, "15 minutes or less" is 0.75, "16-30 minutes" is 2.3, "31-60 minutes" is 4.55 and "More than 60 minutes" is 6. Alternatively, all the estimations and robustness checks performed in the current research have been replicated using for the "More than 60 minutes" category the values of 7.5 and 9, and results do not change. These estimations are available from authors upon request.

of Georgia and Lithuania, they show a significant effect of 0.022 and 0.024 standard deviations (SDs) of every 10-minute increase in homework time, respectively. Nevertheless, although this is a significant effect, when put in the context of PIRLS and TIMSS¹³ (in which scores have an average of 500 and standard deviation of 100), 1-hour increase in homework time would mean an increase of 0.132 and 0.144 SDs, respectively, which is relatively small. Hence, the main results of this analysis would indicate that homework time does not have effect on students' academic achievement. These estimations have been replicated by the use of the original categorical homework time variable (Table A1, Appendix A) and, alternatively, including all countries in the same regression, interacting them with homework time¹⁴, as results do not change.

Robustness checks

The first robustness check aims at checking whether the identification strategy of using student fixed effects is appropriate, as described in the methodology section. To do this, we have restricted the sample to those students who reported that they liked learning the three subjects in the same level and, in another specification, students who were confident in the same level about the three subjects. This is measured by the "Students like learning the subject scale"¹⁵ and "Students confident in the subject scale"¹⁶ indexes provided by PIRLS and TIMSS, for the three subjects, with categories "Like learning the subject", "Somewhat like learning the subject" or "Do not like learning the subject" for the first index and "Confident", "Somewhat confident" or "Not confident" for the second one (Martin, & Mullis, 2002); hence, those students who reported the same category in the three subjects were kept.

¹³ Particularly, in the case of the countries with significant effect of homework their SDs are lower than 100: Georgia has a standard deviation of 76 in reading, 90 in mathematics and 87 in science and, for Lithuania, these figures are 66, 74 and 68, respectively (Mullis, Martin, Foy, & Drucker, 2012; Mullis, Martin, Foy, & Arora, 2012; Martin, Mullis, Foy, & Stanco, 2012).

¹⁴ These estimations will be provided by authors upon request.

¹⁵ It was created by IEA using the questions of the student questionnaire for each subject: "I enjoy learning [the subject]", "I wish I did not have to study [the subject]", "[the subject] is boring", "I learn many interesting things in [the subject]" and "I like [the subject]", being [the subject] mathematics or science. For reading, the questions were "I read only if I have to", "I like talking about what I read with other people", "I would be happy if someone gave me a book as a present", "I think reading is boring", "I would like to have more time for reading" and "I enjoy reading". Students could answer to these questions if they "Agree a lot", "Agree a little", "Disagree a little" or "Disagree a lot". Additionally, for reading, the answers to the question "How often do you do these things outside of school?": "I read for fun" and "I read things that I choose myself", with answers "Every day or almost every day", "Once or twice per week", "Once or twice a month" or "Never or almost never" were used to create the reading index.

¹⁶ It was created by IEA using the questions of the student questionnaire for each subject: "I usually do well in [the subject]", "[the subject] is harder for me than for many of my classmates", "I am just not good at [the subject]", "I learn things quickly in [the subject]", "I am good at working out difficult [the subject] problems" (question only for mathematics), "My teacher tells me I am good at [the subject]" and "[the subject] is harder for me than any other subject", being [the subject] mathematics or science. For reading, the questions were "I usually do well in reading", "Reading is easy for me", "Reading is harder for me than for many of my classmates", "If a book is interesting, I don't care how hard it is to read", "I have trouble reading stories with difficult words", "My teacher tells me I am a good reader" and "Reading is harder for me than any other subject". Students could answer to these questions if they "Agree a lot", "Agree a little", "Disagree a little" or "Disagree a lot".

The results for the sample of students who like learning the three subjects in the same level are presented in Table A2 and for those who are confident in the same level on the three subjects are presented in Table A3 (both in Appendix A). As happened with the main results, homework time does not seem to be significant and, when it does, the effect is relatively small¹⁷.

Another set of robustness checks has been performed employing the remaining homework-related variables in the teacher questionnaire¹⁸: the weekly homework frequency variable described in the Data section and other three homework control variables¹⁹. These variables have been interacted with the homework time variable, and their results have been presented in Tables A4-A7 – Appendix A – (for frequency of homework, correcting assignments and giving feedback, discussing the homework in class and monitoring whether or not the homework was completed, respectively). This robustness check has been performed due to, as it was indicated by Trautwein (2007), homework time can be decomposed into homework-related variables (e.g., frequency) as taking only homework time variable may show and aggregated effect of all of them causing a null effect, as we obtained. However, once, again, our main results do not change.

CONCLUSIONS

The main results of the current analysis have shown that homework time does not seem to affect students' academic achievement in the case of the countries under analysis. This conclusion, although being very strong, has been corroborated by many robustness checks. As previously highlighted, homework research is far from conclusive: it has indicated that a positive or null correlation seems to be happening between homework time and academic achievement, but empirical evidence further than correlation is needed. The current research has worked on this issue using a student fixed effects identification strategy and has shown that, although homework might be different across countries, it seems that fourth grade students do no benefit from it. Furthermore, it has highlighted the relevance of studying the particular case of each country, as a quick look on the heterogeneous amount of assigned homework in each of them and their students' academic achievement may anticipate biased conclusions.

In order to interpret this “null” result it is also relevant to consider that PIRLS and TIMSS measure students' skills or competencies in the three subjects, and not content-based knowledge of students (Kohn, 2006), meaning that these competences are the actual skills that students will be using in the labour market. Thus, the quality of the homework that fourth

¹⁷ Furthermore, these estimations were also replicated using the whole sample of countries and interacting homework time with countries, and results hold. These estimations will be provided by authors upon request.

¹⁸ Whenever a teacher presented a missing observation in any of the three subjects' robustness check homework variables he/she was not included for the specific robustness check using that variable.

¹⁹ These variables are those in R16 in PIRLS and M9C and S8C in TIMSS: “How often do you do the following with the (subject) homework assignments for this class?”, being the three variables “Correct assignments and give feedback to students”, “Discuss the homework in class” and “Monitor whether or not the homework was completed”. The answers to these variables are “Always or almost always”, “Sometimes” and “Never or almost never”.

grade students are performing in the analysed countries does not seem to be enough to develop students' competencies. This could motivate the implementation of two policies: the first one, to increase the quality of this homework, so that fourth grade students can improve their learning at a competence level; the second one, to provide students with the necessary formation in the classroom so that they do not need to devote so much time at home to studying. Hence, these two policies would provide students with few but high quality homework, which may increase their academic achievement. Furthermore, these policies could help students to have more time for extra-curricular activities which can develop other of their skills or to have more leisure time.

To conclude, this research has shown that, in spite of the relevance that society is placing nowadays in getting competitive and productive workers by loads of homework and study hours since early ages, children also need to enjoy their childhood: they will only have one.

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APPENDIX A

Table A1. Effect of assigned homework time (categorical variable) on students' academic achievement. Assigned homework time (Ref.: I do not assign homework)

Countries	15 minutes or less		16-30 minutes		31-60 minutes		More than 60 minutes		Subject: Reading (Ref.: Science)		Subject: Mathematics (Ref.: Science)		Constant		Observations	R-squared
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.		
Australia	0.019	0.036	0.009	0.033	-0.012	0.054	-0.027	0.114	-0.012	0.027	0.001	0.033	0.005	0.054	10,407	0.843
Austria	0.032	0.037	0.065*	0.036	0.088	0.065	X	X	-0.006	0.034	-0.031	0.034	-0.047	0.044	11,781	0.810
Azerbaijan	-0.145	0.135	-0.077	0.129	-0.135	0.138	-0.006	0.122	-0.048	0.054	0.016	0.026	0.210	0.152	7,956	0.737
Croatia	-0.127	0.143	-0.148	0.136	-0.145	0.145	-0.236	0.144	0.000	0.032	0.006	0.027	0.146	0.140	13,254	0.790
Czech Republic	0.000	0.066	-0.008	0.058	-0.013	0.076	-0.235**	0.092	-0.014	0.028	-0.008	0.021	0.036	0.071	9,813	0.810
Finland	-0.125	0.109	-0.105	0.116	-0.046	0.142	X	X	-0.024	0.039	-0.008	0.037	0.108	0.129	11,850	0.775
Georgia	-0.162	0.119	-0.104	0.106	-0.068	0.114	0.009	0.118	-0.001	0.031	-0.008	0.039	0.119	0.122	8,727	0.826
Germany	-0.053	0.052	-0.025	0.052	-0.009	0.072	X	X	0.023	0.035	0.000	0.049	-0.004	0.069	5,688	0.812
Hungary	Ref.	Ref.	-0.007	0.020	-0.013	0.050	-0.100	0.132	0.007	0.028	0.006	0.029	-0.020	0.074	7,521	0.863
Iran, Islamic Rep. Of	-0.023	0.044	-0.006	0.036	-0.019	0.036	0.049	0.055	0.006	0.023	-0.002	0.018	-0.004	0.040	16,305	0.845
Ireland	-0.004	0.036	-0.004	0.059	0.031	0.088	-0.088	0.081	-0.007	0.037	0.004	0.036	0.019	0.043	12,939	0.824
Lithuania	0.049	0.070	0.097	0.069	0.125	0.088	0.183**	0.091	-0.021	0.026	-0.017	0.018	-0.063	0.080	13,206	0.831
Malta	0.011	0.027	-0.018	0.029	0.053	0.042	X	X	-0.010	0.024	0.011	0.018	-0.047	0.030	7,668	0.814
Northern Ireland	0.036	0.083	0.012	0.042	0.040	0.042	0.171	0.201	0.006	0.036	0.006	0.035	0.009	0.052	8,037	0.830
Norway	-0.011	0.054	-0.079*	0.042	-0.060	0.078	-0.299	0.280	0.068*	0.041	0.062*	0.032	0.015	0.059	4,233	0.790
Poland	-0.014	0.093	-0.012	0.099	-0.017	0.103	0.086	0.208	-0.007	0.023	0.003	0.023	0.015	0.102	14,442	0.830
Portugal	0.005	0.089	0.038	0.083	-0.029	0.097	0.003	0.151	-0.003	0.032	0.000	0.018	-0.017	0.107	11,409	0.806
Romania	-0.066	0.078	-0.077	0.081	-0.110	0.086	-0.107	0.083	0.018	0.037	0.015	0.027	0.088	0.064	13,476	0.847
Russian Federation	-0.101	0.098	-0.070	0.075	-0.049	0.069	-0.005	0.119	-0.020	0.031	-0.007	0.026	0.060	0.080	12,822	0.797
Singapore	-0.067	0.059	-0.045	0.060	-0.048	0.057	-0.101	0.127	-0.016	0.021	0.005	0.016	0.099	0.089	6,939	0.850
Slovak Republic	0.014	0.060	-0.014	0.061	-0.057	0.112	X	X	0.034	0.028	-0.001	0.026	-0.023	0.077	9,675	0.846
Slovenia	0.072	0.096	0.051	0.094	0.058	0.110	X	X	0.003	0.032	0.000	0.026	-0.054	0.092	12,738	0.836
Spain	-0.042	0.135	-0.062	0.131	-0.011	0.138	X	X	-0.050	0.045	-0.010	0.031	0.060	0.135	10,608	0.806
Sweden	-0.079	0.137	-0.016	0.063	-0.132**	0.053	X	X	-0.002	0.049	0.005	0.036	0.005	0.074	4,680	0.780

Notes: PIRLS/TIMSS recommended practices have been applied, using both PIRLS and TIMSS Jackknife and student weights. The "Assigned homework time" variable is measured in ten-minutes. Hungary does not have observations in the "I do not assign homework" category, so the category "15 minutes or less" has been used as reference category (indicated as "Ref."). "Coeff." stands for "Coefficient", "S.E." for "Standard error" and "X" means that there are not observations in that category. Estimation method: Student fixed effects. Dependent variable: PIRLS/TIMSS standardised five plausible values. Coefficient: ***Significant at 1%, ** significant at 5%, * significant at 10%. Source: Authors' own calculations.

Table A2. Effect of assigned homework time on students' academic achievement for students who like learning the three subjects in the same level

Countries	Assigned homework time		Subject: Reading (Ref.: Science)		Subject: Mathematics (Ref.: Science)		Constant		Observations	R-squared
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.		
Australia	0.000	0.018	0.026	0.049	0.039	0.032	0.078	0.068	2,328	0.866
Austria	0.018	0.018	-0.022	0.044	0.004	0.059	-0.028	0.057	2,775	0.821
Azerbaijan	0.027	0.028	-0.064	0.069	-0.030	0.034	0.100	0.101	2,868	0.727
Croatia	-0.024	0.016	0.049	0.044	0.043	0.045	0.014	0.070	2,748	0.814
Czech Republic	0.003	0.028	-0.035	0.055	-0.033	0.036	0.058	0.071	2,334	0.809
Finland	0.036	0.039	0.034	0.057	0.044	0.039	-0.117	0.076	2,553	0.797
Georgia	0.021	0.015	0.023	0.047	-0.036	0.045	0.126*	0.071	3,339	0.835
Germany	0.002	0.026	0.093*	0.051	0.061	0.060	0.036	0.093	1,125	0.816
Hungary	-0.004	0.022	0.027	0.042	0.029	0.030	0.028	0.084	1,917	0.875
Iran, Islamic Rep. Of	-0.004	0.008	0.045	0.028	-0.009	0.028	0.040	0.049	6,165	0.853
Ireland	0.017	0.025	0.022	0.062	0.050	0.049	0.013	0.065	2,973	0.850
Lithuania	0.026*	0.015	0.015	0.043	0.011	0.027	-0.009	0.056	3,321	0.847
Malta	0.011	0.017	0.011	0.046	-0.054	0.040	-0.055	0.054	1,878	0.848
Northern Ireland	0.002	0.019	0.049	0.071	0.041	0.044	0.066	0.073	1,707	0.855
Norway	-0.040	0.034	0.105	0.089	0.058	0.068	0.134	0.096	894	0.817
Poland	-0.003	0.014	0.016	0.042	-0.017	0.038	0.023	0.057	3,447	0.855
Portugal	-0.022	0.021	0.004	0.040	0.024	0.025	0.115	0.091	4,209	0.822
Romania	-0.018	0.017	0.060	0.050	0.013	0.040	0.116*	0.065	4,812	0.857
Russian Federation	0.008	0.022	0.021	0.048	0.007	0.030	0.000	0.085	3,429	0.812
Singapore	-0.005	0.017	0.036	0.038	0.045	0.038	0.083	0.101	1,332	0.894
Slovak Republic	-0.002	0.025	0.004	0.043	0.028	0.031	0.026	0.072	2,313	0.857
Slovenia	-0.016	0.020	0.059	0.043	0.017	0.031	0.022	0.048	3,279	0.858
Spain	0.025	0.023	-0.016	0.060	-0.003	0.046	0.004	0.075	2,868	0.839
Sweden	0.006	0.033	-0.013	0.114	-0.010	0.064	0.062	0.095	939	0.761

Notes: PIRLS/TIMSS recommended practices have been applied, using both PIRLS and TIMSS Jackknife and student weights. The "Assigned homework time" variable is measured in ten-minutes. "Coeff." stands for "Coefficient" and "S.E." for "Standard error". The sample is that of students who like learning the three subjects in the same level – "like learning the subject", "somewhat like learning the subject" or "do not like learning the subject". Estimation method: Student fixed effects. Dependent variable: PIRLS/TIMSS standardised five plausible values. Coefficient: ***Significant at 1%, ** significant at 5%, * significant at 10%. Source: Authors' own calculations.

Table A3. Effect of assigned homework time on students' academic achievement for students who are confident in the same level in the three subjects

Countries	Assigned homework time		Subject: Reading (Ref.: Science)		Subject: Mathematics (Ref.: Science)		Constant		Observations	R-squared
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.		
Australia	0.011	0.014	-0.026	0.038	0.038	0.030	0.129**	0.059	2,799	0.863
Austria	0.016	0.014	-0.004	0.038	0.044	0.045	0.192***	0.050	3,804	0.816
Azerbaijan	0.027	0.023	-0.129*	0.077	0.018	0.042	0.323***	0.107	2,619	0.739
Croatia	-0.001	0.013	-0.027	0.046	0.054	0.039	0.266***	0.059	3,840	0.818
Czech Republic	-0.002	0.020	-0.087**	0.042	-0.002	0.030	0.175***	0.059	2,388	0.828
Finland	0.067**	0.027	-0.083*	0.048	0.056*	0.030	0.056	0.084	3,198	0.808
Georgia	0.003	0.018	0.072	0.057	-0.004	0.039	0.155**	0.063	2,562	0.827
Germany	-0.008	0.023	0.013	0.044	0.056	0.048	0.243***	0.088	1,587	0.828
Hungary	0.004	0.015	0.003	0.045	0.026	0.034	0.194**	0.081	2,412	0.881
Iran, Islamic Rep. Of	-0.001	0.010	0.027	0.028	0.016	0.025	0.067	0.052	6,183	0.857
Ireland	-0.002	0.020	0.006	0.051	0.029	0.039	0.176***	0.052	4,089	0.840
Lithuania	0.030**	0.015	0.003	0.047	0.032	0.025	0.084	0.063	3,639	0.847
Malta	0.026*	0.014	-0.058*	0.033	-0.061**	0.028	0.166***	0.046	1,977	0.839
Northern Ireland	0.015	0.019	-0.020	0.061	-0.028	0.055	0.212***	0.060	2,127	0.838
Norway	-0.017	0.020	0.041	0.074	0.052	0.049	0.173*	0.099	1,398	0.815
Poland	-0.019	0.018	0.045*	0.026	-0.013	0.024	0.231***	0.048	4,548	0.850
Portugal	-0.003	0.023	-0.020	0.040	0.047	0.029	0.181*	0.093	3,642	0.806
Romania	-0.007	0.011	0.029	0.042	0.041	0.029	0.150**	0.066	5,085	0.862
Russian Federation	0.003	0.022	-0.012	0.060	0.036	0.027	0.102	0.082	3,378	0.809
Singapore	-0.007	0.015	-0.056	0.044	0.029	0.029	0.136	0.090	1,341	0.884
Slovak Republic	-0.027	0.021	0.022	0.044	0.045	0.027	0.219***	0.067	2,820	0.842
Slovenia	0.011	0.018	0.005	0.037	0.007	0.030	0.193***	0.042	4,227	0.852
Spain	0.026	0.023	-0.033	0.055	0.022	0.037	0.119	0.075	2,805	0.847
Sweden	-0.024	0.025	0.048	0.049	0.064	0.047	0.038	0.081	1,665	0.779

Notes: PIRLS/TIMSS recommended practices have been applied, using both PIRLS and TIMSS Jackknife and student weights. The "Assigned homework time" variable is measured in ten-minutes. "Coeff." stands for "Coefficient" and "S.E." for "Standard error". The sample is that of students who are confident in the same level in the three subjects – "confident", "somewhat confident" or "not confident". Estimation method: Student fixed effects. Dependent variable: PIRLS/TIMSS standardised five plausible values. Coefficient: ***Significant at 1%, ** significant at 5%, * significant at 10%. Source: Authors' own calculations.

Table A4. Effect of the interaction of frequency of homework with assigned homework time on students' academic achievement. Interaction of frequency of homework with assigned homework time (Ref.: I do not assign homework)

Countries	Every day		3 or 4 times a week		1 or 2 times a week		Less than once a week		Subject: Reading (Ref.: Science)		Subject: Mathematics (Ref.: Science)		Constant		Observations	R-squared
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.		
Australia	-0.007	0.022	-0.011	0.021	-0.001	0.009	0.000	0.013	0.005	0.037	0.011	0.028	0.014	0.046	9,711	0.842
Austria	0.019	0.020	0.027	0.019	0.004	0.020	0.018	0.018	0.001	0.039	-0.034	0.054	-0.035	0.048	11,442	0.811
Azerbaijan	0.006	0.020	0.029	0.030	0.039	0.025	0.027	0.035	-0.008	0.070	0.052	0.047	0.063	0.089	7,479	0.738
Croatia	-0.008	0.013	-0.008	0.011	-0.012	0.012	-0.008	0.024	-0.002	0.035	0.002	0.031	0.024	0.040	13,134	0.791
Czech Republic	-0.017	0.027	0.010	0.018	-0.005	0.016	-0.007	0.015	-0.017	0.032	-0.015	0.029	0.041	0.049	9,813	0.810
Finland	0.019	0.029	0.019	0.020	-0.001	0.018	0.004	0.056	-0.035	0.049	-0.029	0.047	-0.015	0.050	11,691	0.775
Georgia	0.023**	0.011	0.026**	0.011	0.029**	0.013	0.060**	0.030	-0.001	0.030	0.009	0.037	-0.065	0.059	8,382	0.826
Germany	0.036	0.025	0.002	0.023	-0.002	0.018	-0.018	0.025	0.000	0.037	-0.079	0.071	-0.022	0.058	5,628	0.813
Hungary	-0.015	0.014	-0.005	0.012	-0.009	0.015	Ref.	Ref.	0.016	0.040	0.010	0.042	-0.012	0.075	7,449	0.864
Iran, Islamic Rep. Of	0.001	0.011	0.001	0.008	0.002	0.008	0.003	0.013	0.004	0.023	-0.005	0.021	-0.009	0.043	15,687	0.842
Ireland	0.007	0.023	-0.017	0.022	0.007	0.028	0.006	0.021	0.000	0.043	0.011	0.038	-0.002	0.041	12,732	0.824
Lithuania	0.027**	0.011	0.015	0.016	0.017	0.015	0.014	0.016	-0.032	0.037	-0.016	0.033	-0.014	0.049	13,053	0.831
Malta	0.020*	0.012	0.009	0.016	0.010	0.014	-0.005	0.010	-0.034	0.031	-0.041	0.028	-0.042	0.029	6,915	0.814
Northern Ireland	-0.011	0.019	0.016	0.017	0.010	0.016	0.016	0.013	0.030	0.068	0.002	0.052	-0.001	0.048	7,776	0.831
Norway	-0.036	0.030	0.009	0.024	-0.020	0.018	-0.007	0.027	0.073	0.072	0.037	0.044	-0.001	0.061	4,182	0.791
Poland	0.005	0.012	0.000	0.014	-0.003	0.014	-0.002	0.012	-0.014	0.031	-0.005	0.029	0.006	0.039	14,442	0.830
Portugal	0.008	0.028	0.007	0.016	-0.012	0.018	-0.018	0.018	-0.034	0.034	-0.015	0.021	0.024	0.075	11,097	0.807
Romania	-0.015	0.014	-0.016	0.016	-0.016	0.013	-0.012	0.011	0.031	0.043	0.017	0.043	0.046	0.056	13,173	0.849
Russian Federation	0.022	0.016	0.009	0.014	0.000	0.014	0.078**	0.032	-0.058	0.039	-0.044	0.035	-0.015	0.065	12,738	0.798
Singapore	0.005	0.012	-0.003	0.013	-0.005	0.010	-0.003	0.013	-0.024	0.023	-0.011	0.031	0.062	0.070	5,772	0.851
Slovak Republic	-0.025	0.026	-0.017	0.022	-0.018	0.020	-0.003	0.019	0.045	0.032	0.009	0.025	-0.003	0.071	9,606	0.846
Slovenia	0.002	0.015	-0.006	0.013	-0.012	0.019	-0.011	0.023	-0.004	0.037	-0.013	0.031	0.022	0.045	12,654	0.836
Spain	-0.004	0.017	0.013	0.018	0.000	0.024	-0.011	0.029	-0.036	0.048	-0.009	0.034	-0.009	0.059	10,332	0.806
Sweden	0.029	0.056	-0.015	0.027	-0.006	0.022	-0.022	0.022	-0.016	0.074	-0.006	0.062	0.011	0.071	4,563	0.780

Notes: PIRLS/TIMSS recommended practices have been applied, using both PIRLS and TIMSS Jackknife and student weights. The "Assigned homework time" variable is measured in ten-minutes. Hungary does not have observations in the "I do not assign homework" category, so the category "Less than once a week" has been used as reference category (indicated as "Ref."). "Coeff." stands for "Coefficient" and "S.E." for "Standard error". Estimation method: Student fixed effects. Dependent variable: PIRLS/TIMSS standardised five plausible values. Coefficient: ***Significant at 1%, ** significant at 5%, * significant at 10%. Source: Authors' own calculations.

Table A5. Effect of the interaction of teachers correcting assignments and giving feedback with assigned homework time on students' academic achievement. Interaction of correcting assignments and giving feedback with assigned homework time (Ref.: I do not assign homework)

Countries	Always or almost always		Sometimes		Never or almost never		Subject: Reading (Ref.: Science)		Subject: Mathematics (Ref.: Science)		Constant		Observations	R-squared
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.		
Australia	-0.002	0.010	0.001	0.028	-0.036*	0.021	0.000	0.027	0.010	0.030	0.013	0.052	10,308	0.843
Austria	0.017	0.013	0.025	0.019	0.061	0.098	0.001	0.031	-0.018	0.034	-0.041	0.047	11,445	0.811
Azerbaijan	0.012	0.019	0.006	0.034	0.018	0.076	-0.041	0.059	0.000	0.030	0.087	0.089	7,599	0.740
Croatia	-0.007	0.010	-0.015	0.015	X	X	0.001	0.032	0.007	0.027	0.028	0.038	13,104	0.790
Czech Republic	-0.005	0.013	0.012	0.026	0.230**	0.102	-0.009	0.027	-0.001	0.022	0.031	0.049	9,705	0.810
Finland	0.007	0.024	0.023	0.020	0.017	0.030	-0.025	0.040	-0.010	0.039	-0.040	0.053	11,259	0.777
Georgia	0.024***	0.009	0.017	0.011	-0.012	0.037	0.005	0.031	-0.005	0.039	-0.022	0.057	8,214	0.828
Germany	0.028	0.017	-0.003	0.019	0.003	0.025	0.025	0.033	-0.003	0.048	-0.064	0.059	5,475	0.814
Hungary	-0.005	0.012	-0.011	0.013	Ref.	Ref.	0.006	0.029	0.008	0.030	-0.015	0.076	7,350	0.863
Iran, Islamic Rep. Of	0.001	0.007	-0.001	0.009	-0.167	0.185	0.005	0.022	-0.005	0.019	-0.011	0.039	16,287	0.845
Ireland	0.000	0.015	0.016	0.054	0.004	0.053	-0.008	0.034	0.004	0.031	0.017	0.039	12,753	0.824
Lithuania	0.021*	0.011	0.019	0.012	0.059	0.051	-0.018	0.028	-0.011	0.020	-0.020	0.045	12,786	0.831
Malta	0.011	0.009	-0.010	0.014	-0.038	0.041	-0.009	0.025	-0.003	0.019	-0.062**	0.028	7,491	0.815
Northern Ireland	0.007	0.009	0.028	0.021	-0.054	0.060	0.009	0.042	0.001	0.032	0.012	0.043	8,037	0.830
Norway	-0.014	0.017	-0.035*	0.020	-0.063	0.055	0.058	0.041	0.047	0.034	0.010	0.059	4,182	0.790
Poland	-0.002	0.011	0.017	0.017	0.182	0.271	-0.004	0.025	0.000	0.025	0.002	0.038	14,442	0.830
Portugal	-0.009	0.015	0.007	0.020	-0.031	0.076	0.000	0.032	0.007	0.017	0.021	0.066	11,172	0.807
Romania	-0.013	0.010	-0.019	0.022	X	X	0.030	0.040	0.015	0.026	0.036	0.056	13,218	0.848
Russian Federation	0.012	0.014	0.021	0.026	0.045	0.036	-0.024	0.032	-0.005	0.027	-0.046	0.070	12,669	0.797
Singapore	-0.005	0.008	-0.005	0.017	0.020	0.035	-0.025	0.024	0.006	0.015	0.069	0.065	6,939	0.850
Slovak Republic	-0.011	0.016	-0.037	0.031	-0.046	0.028	0.041	0.027	-0.001	0.022	0.012	0.073	9,396	0.846
Slovenia	-0.005	0.014	-0.005	0.014	0.008	0.035	0.000	0.033	-0.002	0.025	0.019	0.038	12,420	0.836
Spain	0.004	0.015	-0.016	0.050	-0.045	0.522	-0.046	0.045	-0.013	0.031	0.001	0.052	10,479	0.806
Sweden	-0.012	0.018	-0.032	0.029	-0.059*	0.031	0.006	0.057	0.012	0.038	0.003	0.067	4,527	0.780

Notes: PIRLS/TIMSS recommended practices have been applied, using both PIRLS and TIMSS Jackknife and student weights. The "Assigned homework time" variable is measured in ten-minutes. Hungary does not have observations in the "I do not assign homework" category, so the category "Never or almost never" has been used as reference category (indicated as "Ref."). "Coeff." stands for "Coefficient", "S.E." for "Standard error" and "X" means that there are not observations in that category.

Estimation method: Student fixed effects.

Dependent variable: PIRLS/TIMSS standardised five plausible values.

Coefficient: ***Significant at 1%, ** significant at 5%, * significant at 10%.

Source: Authors' own calculations.

Table A6. Effect of the interaction of discussing the homework in class with assigned homework time on students' academic achievement. Interaction of discussing the homework in class with assigned homework time (Ref.: I do not assign homework)

Countries	Always or almost always		Sometimes		Never or almost never		Subject: Reading (Ref.: Science)		Subject: Mathematics (Ref.: Science)		Constant		Observations	R-squared
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.		
Australia	0.003	0.010	-0.026	0.024	-0.052**	0.022	0.006	0.026	0.012	0.030	0.014	0.052	10,254	0.843
Austria	0.014	0.013	0.026*	0.014	0.024	0.039	-0.001	0.033	-0.029	0.035	-0.034	0.049	11,682	0.811
Azerbaijan	0.021	0.020	0.041	0.025	-0.082	0.062	-0.047	0.060	0.012	0.026	0.077	0.099	7,521	0.739
Croatia	-0.008	0.011	-0.009	0.012	-0.167	0.147	0.006	0.032	0.008	0.028	0.027	0.037	13,020	0.790
Czech Republic	-0.004	0.016	-0.002	0.015	0.233**	0.100	-0.014	0.030	-0.005	0.024	0.037	0.051	9,546	0.810
Finland	0.010	0.021	0.039*	0.023	0.022	0.069	-0.026	0.037	-0.014	0.036	-0.030	0.055	11,823	0.776
Georgia	0.024**	0.010	0.018	0.011	0.071	0.090	-0.002	0.031	-0.012	0.038	-0.041	0.060	8,475	0.827
Germany	0.004	0.018	0.022	0.025	-0.019	0.091	0.016	0.034	-0.001	0.046	-0.047	0.059	5,667	0.812
Hungary	-0.007	0.011	Ref.	Ref.	X	X	0.009	0.028	0.007	0.030	-0.008	0.076	7,434	0.862
Iran, Islamic Rep. Of	-0.004	0.009	0.005	0.007	0.012	0.027	0.003	0.022	-0.004	0.019	-0.011	0.039	16,167	0.845
Ireland	0.005	0.016	-0.012	0.036	0.016	0.059	-0.008	0.033	0.001	0.031	0.016	0.039	12,795	0.824
Lithuania	0.021*	0.011	0.022	0.015	X	X	-0.020	0.026	-0.012	0.018	-0.024	0.045	12,855	0.832
Malta	0.010	0.009	-0.002	0.016	-0.018	0.029	-0.016	0.027	-0.006	0.018	-0.063**	0.028	7,491	0.815
Northern Ireland	0.008	0.010	0.001	0.017	0.005	0.067	0.010	0.040	0.005	0.032	0.009	0.044	7,875	0.830
Norway	-0.021	0.017	-0.016	0.018	-0.170***	0.051	0.057	0.041	0.054	0.033	0.006	0.060	4,182	0.791
Poland	0.004	0.010	-0.011	0.016	0.178	0.119	-0.003	0.025	0.006	0.024	-0.001	0.039	14,319	0.830
Portugal	-0.010	0.017	0.005	0.016	-0.037	0.033	-0.003	0.033	0.004	0.018	0.020	0.067	11,151	0.807
Romania	-0.012	0.009	-0.015	0.019	X	X	0.021	0.039	0.010	0.026	0.049	0.055	13,332	0.846
Russian Federation	0.011	0.014	0.011	0.016	0.077	0.050	-0.018	0.031	-0.007	0.026	-0.037	0.066	12,822	0.797
Singapore	-0.007	0.009	0.004	0.014	0.016	0.034	-0.024	0.024	0.005	0.015	0.069	0.065	6,939	0.850
Slovak Republic	-0.014	0.021	-0.021	0.023	0.061	0.193	0.039	0.028	0.005	0.022	-0.008	0.073	9,510	0.846
Slovenia	-0.002	0.013	-0.019	0.013	-0.081	0.077	0.003	0.030	-0.001	0.023	0.016	0.039	12,255	0.837
Spain	0.001	0.014	0.008	0.022	-0.002	0.053	-0.051	0.044	-0.011	0.031	0.001	0.050	10,455	0.806
Sweden	-0.017	0.017	-0.014	0.022	-0.058	0.062	0.002	0.057	0.017	0.038	-0.001	0.067	4,440	0.781

Notes: PIRLS/TIMSS recommended practices have been applied, using both PIRLS and TIMSS Jackknife and student weights. The "Assigned homework time" variable is measured in ten-minutes. Hungary does not have observations in the "I do not assign homework" and "Never or almost never" categories, so the category "Sometimes" has been used as reference category (indicated as "Ref."). "Coeff." stands for "Coefficient", "S.E." for "Standard error" and "X" means that there are not observations in that category.

Estimation method: Student fixed effects.

Dependent variable: PIRLS/TIMSS standardised five plausible values.

Coefficient: ***Significant at 1%, ** significant at 5%, * significant at 10%.

Source: Authors' own calculations.

Table A7. Effect of the interaction of monitoring whether or not the homework was completed with assigned homework time on students' academic achievement. Interaction of monitoring whether or not the homework was completed with assigned homework time (Ref.: I do not assign homework)

Countries	Always or almost always		Sometimes		Never or almost never		Subject: Reading (Ref.: Science)		Subject: Mathematics (Ref.: Science)		Constant		Observations	R-squared
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.		
Australia	-0.004	0.010	-0.044	0.041	0.068	0.062	-0.003	0.027	0.012	0.030	0.017	0.054	10,284	0.843
Austria	0.019	0.013	-0.027	0.033	0.059	0.063	0.003	0.031	-0.024	0.034	-0.042	0.048	11,541	0.811
Azerbaijan	0.010	0.019	0.034	0.032	X	X	-0.031	0.062	0.008	0.026	0.096	0.089	7,428	0.737
Croatia	-0.009	0.010	-0.016	0.019	X	X	0.007	0.032	0.008	0.028	0.025	0.037	13,095	0.790
Czech Republic	-0.006	0.013	-0.198	0.237	0.211***	0.073	-0.018	0.028	-0.004	0.021	0.042	0.048	9,435	0.811
Finland	0.019	0.019	0.040	0.034	0.465**	0.206	-0.027	0.041	-0.009	0.038	-0.039	0.056	11,676	0.776
Georgia	0.026***	0.010	0.027	0.020	0.023	0.078	0.011	0.031	-0.008	0.040	-0.050	0.062	8,172	0.829
Germany	0.007	0.017	0.005	0.027	-0.105	0.120	0.011	0.034	-0.002	0.047	-0.042	0.058	5,598	0.812
Hungary	-0.006	0.011	Ref.	Ref.	X	X	0.006	0.028	0.007	0.030	-0.009	0.076	7,377	0.863
Iran, Islamic Rep. Of	0.000	0.007	0.000	0.010	0.005	0.106	0.005	0.022	-0.004	0.019	-0.014	0.039	16,167	0.845
Ireland	0.001	0.017	0.000	0.029	0.136*	0.078	-0.006	0.033	0.003	0.032	0.015	0.038	12,834	0.824
Lithuania	0.022*	0.011	0.014	0.019	0.027	0.021	-0.020	0.027	-0.011	0.019	-0.020	0.046	12,711	0.832
Malta	0.010	0.009	0.016	0.024	0.069*	0.036	-0.027	0.027	-0.003	0.019	-0.067**	0.028	7,491	0.815
Northern Ireland	0.007	0.010	0.016	0.023	-0.016	0.188	0.009	0.042	0.005	0.032	0.011	0.044	7,953	0.830
Norway	-0.016	0.015	-0.044*	0.025	-0.069	0.083	0.055	0.041	0.047	0.033	0.007	0.060	4,182	0.790
Poland	0.001	0.011	-0.073**	0.033	X	X	-0.004	0.025	0.002	0.025	0.001	0.039	14,319	0.830
Portugal	-0.008	0.016	-0.021	0.078	0.045	0.063	-0.002	0.033	0.004	0.018	0.022	0.066	11,235	0.807
Romania	-0.012	0.010	-0.027	0.024	X	X	0.020	0.040	0.010	0.026	0.051	0.055	13,284	0.847
Russian Federation	0.011	0.014	0.046*	0.026	0.044	0.055	-0.017	0.030	-0.006	0.026	-0.040	0.065	12,672	0.797
Singapore	-0.005	0.009	-0.004	0.022	0.016	0.044	-0.023	0.023	0.006	0.015	0.069	0.065	6,939	0.850
Slovak Republic	-0.016	0.018	-0.059	0.039	-0.044	0.061	0.037	0.028	0.003	0.023	0.000	0.072	9,513	0.846
Slovenia	-0.004	0.013	0.015	0.053	0.013	0.031	-0.003	0.032	-0.003	0.024	0.017	0.039	12,039	0.837
Spain	0.003	0.016	-0.007	0.048	-0.255	0.427	-0.048	0.045	-0.011	0.031	0.000	0.053	10,398	0.806
Sweden	-0.014	0.018	-0.034	0.033	-0.075**	0.034	-0.004	0.057	0.014	0.038	0.004	0.066	4,629	0.779

Notes: PIRLS/TIMSS recommended practices have been applied, using both PIRLS and TIMSS Jackknife and student weights. The "Assigned homework time" variable is measured in ten-minutes. Hungary does not have observations in the "I do not assign homework" and "Never or almost never" categories, so the category "Sometimes" has been used as reference category (indicated as "Ref."). "Coeff." stands for "Coefficient", "S.E." for "Standard error" and "X" means that there are not observations in that category.

Estimation method: Student fixed effects.

Dependent variable: PIRLS/TIMSS standardised five plausible values.

Coefficient: ***Significant at 1%, ** significant at 5%, * significant at 10%.

Source: Authors' own calculations.

