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The Behavioral Determinants of School Achievement: A Lab in the Field Experiment in Middle School

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Working Paper



The Behavioral Determinants of School Achievement: A Lab in the Field Experiment in Middle School

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Abstract

In this paper, we investigate how soft skills are related to educational achievement. We run a lab in the field experiment with pupils in Middle Schools to ask whether altruism, cooperation, willingness to compete and intrinsic motivation influence educational attainment. We find that willingness to compete is a strong predictor of individual educational achievement, while altruism is on the contrary negatively correlated with pupils' success. Family background is a strong predictor of educational attainment. After controlling for individual and social preferences, we find that girls outperform boys.

Key words: lab-in-the-field experiment; education; soft skills; preferences; cooperation; competition; teenagers.

JEL code: C70, A13, C92.

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1. Introduction

Deciding how much to invest in education is probably one of the most important economic decisions that people make in their life. Education determines many individual lifetime outcomes, such as earnings (e.g. Psacharopoulos and Patrinos 2004; Heckman et al., 2006a), employment opportunities (Rephann, 2002), and many socioeconomic outcomes like health, delinquency and voting (Lochner, 2011; Grossmann 2006). Understanding the factors that shape school performance is therefore of great importance.

Up until recently, the literature in the economics of education focused mainly on the role of cognitive skills in educational attainment (e.g. Cunha and Heckman, 2007; Spence, 1973). In the last decade, however, researchers have become increasingly interested in the impact of “non-cognitive skills” (or “soft skills”) on educational achievement (Heckman et al., 2006b). These non-cognitive skills refer to a range of behaviors and abilities that are the subjects of a large literature in behavioral and experimental economics, such as impatience, self-control and intrinsic motivation (i.e. Sutter et al., 2013 Golsteyn et al., 2014; Ben-Ner, Avner et al. 2017 ; List et al. 2018 ; Cappelen et al. 2020 ; Andreoni et al. 2020 ; List et al ; 2021 ; Fiala et al. 2022 ; List 2022). Some work has highlighted the role of patience and self-control in educational attainment (Shoda et al. 1990; Duckworth and Seligman, 2005, Sutter et al., 2013 Golsteyn et al., 2014). For instance, Golsteyn et al. (2014) uncover a negative relationship between impatience and school performance. In the same vein, Shoda et al. (1990) find that the ability to delay gratification at age 4 is related to academic ability as a teenager. Duckworth and Seligman (2005) observe that self-discipline is a good predictor of the academic performance of adolescents. Oreopoulos (2007) considers the role of self-control problems as predictors of high-school dropout. Almlund et al. (2011) find that the personality-trait measures such as the Big Five have a predictive power comparable to that of IQ.

While this work has examined the relationship between non-cognitive skills like patience and self-control and educational achievement, less is known about the role of social preferences. These latter reflect that individuals care not only about their own outcomes, but also those of others. We

here focus on four soft skills that are mainly related to social preferences: competitiveness, cooperativeness, altruism and intrinsic motivation. We argue that the willingness to compete could be an important behavioral factor in school achievement, as we can reasonably think that those who are more competitive will exert greater effort at school (Niederle and Vesterlund, 2007, 2011). It can also be argued that both altruism and cooperation in social dilemmas reflect a form of social intelligence, which may translate into academic success. To measure these social preferences, and investigate how they affect school performance, we ran classroom experiments⁴ in five Middle Schools in France in October 2018. 432 pupils aged between 12 and 13 from 22 different classes participated in the study. The experiment consisted of three distinct games: *i*) a real-effort task, where pupils chose their remuneration scheme between a flat wage and a tournament in order to measure their taste for competition; *ii*) a modified dictator game, to produce a measure of altruism; and *iii*) a Voluntary Contribution Mechanism to capture their propensity to cooperate. We also obtained their school grades (in Mathematics, English, History and Geography, and overall GPA⁵), which we regress on our measures of competitiveness, cooperativeness and altruism.

Our paper is closely related to Horn and Kiss (2018), who investigate the relationship between various individual and social preferences and school achievement among Hungarian university students. School achievement is measured there by the GPA and grades in an Economics exam. Our paper differs from theirs in two main dimensions: first, our participants are much younger, allowing us to test whether their findings are robust among younger pupils; second, we consider a variety of measures of school achievement, whereas Horn and Kiss (2018) focused on GPA and Economics. Our inclusion of English, History and Geography accounts for a broader range of educational achievement. For instance, Mathematics requires a certain type of reasoning - obtaining

⁴ It is difficult to infer the role of such behavioral factors from classic survey data. A core motivation of experimental economics is to incentivize participants to reveal their 'true' preferences. It remains unclear to what extent children's self-reported behaviors are biased in an educational setting. They might over or under-declare their preferences.

⁵ The Grade Point Average (GPA) is the sum of all the course grades from the first semester of the 2018-2019 academic year.

the right results and calculation – that might be different from that in other subjects.

We will show that a number of behavioral factors do indeed matter for educational performance. More specifically, willingness to compete is positively correlated with grades: more-competitive students perform better. Consistent with previous work, we also find a significant gender gap in competitiveness. More surprisingly, we find that altruism is negatively associated with pupils' success in most of the subjects we analyze. Last, there is no correlation between cooperative behavior and school achievement.

The remainder of the paper is organized as follows. Section 2 sets out the experimental design, and Section 3 the behavioral predictions. Section 4 then lists our findings. Section 5 discusses these results and concludes.

2. Experimental Design

2.1 Procedures

Our experiment took place in five Middle Schools in Brittany, France, in October 2018. 432 students aged between 12 and 13 from 22 7th-grade classes participated. We obtained approval from the regional Board of Education (the Rectorate of Brittany) and the School Headmasters. We also requested authorization from the parents. Among all parents, 27 parents (4.6% of the 587 eligible participants) refused to let their child participate. Parents were not informed about the details of the experiment, except for the way in which the pupils would be rewarded.

We ran the experiment using a mobile laboratory with 20 tablets, which allowed us to apply conditions very similar to those found in a traditional laboratory (see Appendix A.1). We emphasized the strict anonymity of decisions, and that there were no 'right answers'. Participants were forbidden to chat to each other during the experiment. At the beginning of the experiment, we carefully explained each game's rules and ran comprehension tests to ensure that the students fully understood the rules. Table 1 shows the number of session participants by school and class.

Table 1: Number of Participants by school and class

School	Class						Total
	1	2	3	4	5	6	
1	20	16	20	20	20	-	96
2	20	20	20	16	20	-	96
3	20	20	-	-	-	-	40
4	20	20	20	20	-	-	80
5	20	20	20	18	20	20	118
Total	100	96	80	76	60	20	432

As our mobile laboratory was restricted to 20 computers, students in each class were randomly chosen to participate in the experiment. The remaining students were asked to fill out a survey. Appendix A.2 shows that the subjects who were selected to participate were not significantly different from those who answered the survey with respect to most of the characteristics considered.

In May 2019, we returned to the five schools to obtain pupils' grades in English, Mathematics, History and Geography, and their GPA in the current school year. The collection of individual grades via the school administration produces a reliable school-achievement measure for all of the pupils who participated in the experiment. Of the 432 initial participants, 3 were excluded as they did not provide all of the information in the post-experiment survey. Furthermore, in the time between the experiment and our second visit, seven pupils changed school without having any grades for the Spring semester. Our final sample thus covers 422 pupils.

Although it is standard procedure in experimental economics to use monetary incentives to elicit meaningful responses from participants, it is often difficult or even impossible to use these with

children. Paying children in cash may not be allowed by all of the parties involved, including parents and School Headmasters. Furthermore, teachers may prohibit children from bringing cash to school. Last, it can also be reasonably argued that children do not have a precise value of money. To circumvent these difficulties, most experimenters do not use cash payments as incentives, and prefer instead gift certificates (e.g. Harbaugh et al. (2002); Bettinger and Slonim (2007); Castillo et al. (2011)).⁶ We here awarded children tokens according to their choices that could be converted at the end of the experiment into vouchers, gifts (for example, mugs and pencils) or candies. This covers durable and immediate rewards to incentivize participants similarly independent of their preferences for a given gratification. The average value of gifts was around 8 Euros. This is consistent with Fehr et al. (2008), who assess weekly pocket money at 4.7 Euros for 10-11 year-olds and 6.5 Euros for 12-13 year-olds. The feedback from children and teachers indicated that the remuneration scheme did incentivize participants.

2.2 The experimental games

Our experiment consists of three different games: *i*) a Voluntary Contribution Mechanism (VCM) game to capture cooperativeness⁷; *ii*) a modified dictator game to measure altruism; and *iii*) a real-effort task where participants chose their preferred remuneration scheme between a tournament and a flat-wage scheme).⁸ All pupils played all three games, and we kept the same order of games: the public-good game was played first, then the modified dictator game, and last the real-effort

⁶ For instance, Harbaugh et al. (2002); Bettinger and Slonim (2007), and Castillo et al. (2011) use vouchers or small gifts as rewards to elicit risk aversion. Harbaugh et al. (2007) give subjects an endowment of five white poker chips before each round instead of cash. Subjects knew that they could use these tokens to purchase goods such as fancy pencils, small stuffed animals, superballs and toy airplanes from a store that they set up at the end of the experiment. Fan (2000) used coupons for the school store. Children could then use these coupons to purchase stationery, milk, juice or snacks. Gummerum et al. (2010) and Benenson et al. (2007) use stickers in a dictator game as young children value stickers. Conducting children's experiments is also cheap: payoffs in candy represent significant changes in their budget constraints and are generally enough to make them think carefully about their decisions.

⁷ The main overall pattern observed in voluntary experiments is that initial contributions are substantial, but decline overtime as the game is repeated (Isaac et al., 1984; Andreoni, 1988; Isaac and Walker, 1988a; Ledyard, 1995). A number of mechanisms have been identified to promote cooperation considerably, including preplay communication (i.e. Isaac and Walker, 1988), punishment (e.g., Fehr and Gächter., 2000, Masclet et al., 2003; Bochet et al., 2006; Carpenter; 2007), rewards Sefton et al., 2007) or voluntary participation to collective action (Nosenzo and Tufano, 2017).

⁸ A fourth game was played but is not presented in this study. All of the games were programmed using Z-tree (Fischbacher, 2007).

task.⁹

The first game in the experiment is a repeated public-good game, lasting for six periods. At the beginning of the game, players were matched in groups of four. The composition of the group remained the same for the entire game (*i.e.* a matching partner protocol). In each period, each participant was endowed with 20 tokens and had the opportunity to allocate a part of her endowment to a group account. The MPCR (Marginal Per Capita Return) was set to 0.5. The payoff function is given by:

$$\pi: 20 - c_i + 0.5 \sum_{j=1}^n c_j \quad (1)$$

where c_i is individual i 's contribution.

The second game is a modified dictator game based on Berg et al. (1995). Here each participant i is endowed with 50 tokens and had the opportunity to give a share of this amount to another randomly-chosen participant j in the classroom. At the same time, another participant k had the opportunity to share their endowment with participant i . The participant did not have any information about the decisions of the other individuals when making their own choice. The profit function for each player i is $\pi_i = 50 - S_{ij} + S_{ki}$, where S_{ij} is the number of tokens sent by player i to player j and S_{ki} the number of tokens received by player i from player k .

The third game is a real-effort task inspired by Charness et al. (2014). Participants here decoded one-digit numbers into letters from a grid of letters displayed on the tablet for three minutes (see Appendix A.3 for details). The task is simple, does not require the use of memory or any particular skills, and was particularly meticulous, producing disutility. Participants were free to not decode any letters.

Before the decoding tasks, participants were asked to choose a remuneration scheme: either a flat wage or a tournament. This game thus produces a measure of competitiveness via the remuneration choice, and a measure of effort that will enable us to see whether effort in the real task

⁹ We acknowledge that there could be order effects. However, to limit these participants were informed about their payoffs only at the end of the experiment. Furthermore, participants' partners were separately randomly assigned in each of the three games, so that there were no reputation effects.

is correlated with grades. The decoding task was a one-shot game. Participants were continuously informed of their correct answers, but did not have any information regarding others' performance. If they submitted a wrong answer, they had to decode the same letter until the correct answer was given. Once the three minutes had elapsed, the tablet displayed a screen with their productivity and that of their counterpart (who had also chosen the tournament, and to whom the individual's performance was to be compared) if they had chosen the tournament.¹⁰ The tournament winner received $\pi_i = 80$ tokens if she won the tournament and $\pi_i = 20$ tokens otherwise. A random draw broke ties in the tournament. If the participant chose the flat wage, the payment was 50 tokens irrespective of the numbers of letters decoded.

3. Predictions and Behavioral Assumptions

We begin by considering competitiveness and school performance. We conjecture that choosing the tournament scheme in the decoding task reflects some kind of competitiveness, which may be positively related to grades. Previous work has shown that competition stimulates individual productivity, with a larger effect for males (Gneezy et al., 2003; Niederle and Vesterlund, 2007, 2011). Competitiveness also influences career choices, as the willingness to compete increases the likelihood of pursuing and being accepted in competitive academic tracks (Buser et al., 2014; 2017; Kamas and Preston, 2012). Buser et al. (2014) and Buser et al. (2017) elicit the willingness to compete before school subject choices, and find that pupils who are more willing to compete are more likely to go to selective/STEM (Science, Technology, Engineering, and Mathematics) tracks.¹¹ Kamas and Preston (2012) use a 'winner takes all' experiment to elicit various measures

¹⁰ Experimenters usually provide participants with alternative uses of time in traditional laboratory settings. Our design did not offer these kinds of leisure activities. This might lead to participants exerting effort to avoid boredom. To mitigate this effect, we made clear to participants that they were free not to decode any letters and take a nap or do whatever they wanted as long as they were quiet.

¹¹ Competitive entrance exams are another setting in which the interaction between competitiveness and educational achievement can be evaluated. Ors et al. (2008) compare applicants' performance in the HEC entry exam (where the acceptance rate is 13%) to their national high-school exam grades. Despite girls having on average higher grades in high school, boys perform better than girls in this more-competitive environment. In a similar spirit, Jurajda and Munich (2011) examine applicants' performance when applying to tuition-free universities, with the program's selectivity as an instrument for competitiveness. They show that men perform better than women when the program is more selective. Schlosser et al. (2019) find similar patterns in the GRE exam.

of confidence, which they show are related to career choice. There are no gender differences within STEM students, while differences in confidence among students in humanities and social sciences explain the gender differences in the willingness to compete. Furthermore, evidence suggests that this individual willingness to compete is associated with greater school achievement. Horn and Kiss (2018) investigate the relationship between risk, time, social and competitive preferences of university students and their cognitive abilities. They note that future-oriented and competitive students have higher GPAs. Based on these results, we conjecture that the choice of the tournament scheme will be positively correlated with the student's grades.

Hypothesis 1 (Competitiveness): *Willingness to compete increases student academic achievement.*

Consider now cooperation, as measured by the individual's average contribution in the public good game. It seems plausible that students help each other in more-cooperative environments, which may improve educational attainment in general. This cooperation may furthermore reflect some kind of social intelligence that could feed through to grades. A number of studies have shown that behavior in the public-good game is generally positively correlated with effort and school performance (see for instance Englmaier and Gebhardt, 2016; Galizzi and Navarro-Martinez, 2015). Jones (2008) carries out a large meta-analysis from 1959-2003 based on experiments run in various universities, and finds a positive relationship between university average SAT score and cooperation in prisoner's dilemma experiments. In Horn and Kiss (2018), cooperative preferences measured by the amount of money offered in a public-good game are also strongly correlated with GPA. However, the authors point out that the relationship is non-linear: students who offered around half of the possible amount had significantly higher GPAs as compared to those who offered none or all of their money. The literature also provides compelling evidence of a relationship between IQ, or more broadly cognitive abilities, and cooperation (Burks et al., 2009; Lohse, 2016; Al-Ubaydli et al., 2016; Benito-Ostolaza et al., 2016; Baghestanian and Frey, 2016). Burks et al. (2009) observe a positive relationship between participant IQ and cooperation in a sequential Prisoners' Dilemma. In three one-shot public-good games, Lohse (2016) finds a positive relationship between

cognitive abilities, measured via CRT scores, and cooperation. Al-Ubaydli et al. (2016) extend this study to a finitely-repeated prisoner's dilemma game to test the relationship between cognitive ability and cooperation, and find no direct connection between the two. Their results suggest that high ability might be associated with greater cooperation if all group members have higher cognitive ability.

Based on this previous work, we conjecture that willingness to cooperate improves educational outcomes:

Hypothesis 2 (Cooperativeness): *Greater cooperation in the public-good game is associated with better educational performance.*

The situation regarding altruism and educational achievement is *a priori* less clear-cut. On the one hand, altruism may simply reflect a deviation from rational decisions (e.g., Chen et al. (2013)), and in this case there would be a negative relationship with educational attainment. On the other hand, deviating from standard predictions in the dictator game may reflect social preferences rather than irrationality, and so some kind of social intelligence. In this case, the more altruistic may have better grades.

The empirical evidence is mixed. Some previous work has shown that participants with greater cognitive ability are more likely to be self-interested and maximize their payoffs in dictator games. Brandstätter and Güth (2002) find a negative relationship between giving in a dictator game and performance on cognitive tests. Ben-Ner et al. (2004) also underline a negative relationship between giving in a dictator game and performance on a cognitive-ability test. In the same vein, Benjamin et al. (2013) measure cognitive abilities by Math grades and GPA, and find a negative relationship between Mathematics grades and altruism.¹² Ponti and Rodriguez-Lara (2015) ran different forms of dictator games and sorted participants into groups by their CRT scores. They find that impulsive participants, those considered to have lower cognitive

¹² The evidence in Chen et al. (2013) is mixed. Similar to Brandstätter and Güth (2002), Ben-Ner et al. (2004), and Benjamin et al. (2013), there is a negative relationship between giving in dictator games and measures of cognitive ability. By contrast, there is also a negative relationship between GPA and selfishness using the SVO measure.

ability, were more inequity-averse. At the same time, reflective dictators (*i.e.* those with the highest score) had lower distributional concerns than did impulsive participants. These contributions suggest that selfishness in the dictator game is positively correlated with cognitive ability. However, other work has come to the opposite conclusion. For instance, in Millet and Dewitte (2007) there is a positive relationship between the Raven Progressive Matrix test of cognitive ability and altruistic behavior. Altruism may then be a costly signal used by intelligent participants to signal cognitive abilities to others. Millet and Dewitte (2007) note that unconditional altruism might be a type of signal for social ability or, more broadly, intelligence.

The literature is overall ambiguous about the relationship between altruism and educational outcomes, depending on whether altruism reflects irrationality or social intelligence. We do not then have a clear conjecture in this respect.

Hypothesis 3. *Prosocial behavior is negatively (positively) related to school performance if altruism reflects irrationality (social intelligence).*

Our fourth hypothesis relates to the effort exerted in particular in the real-task game. While effort in the tournament may reveal the desire to win the tournament, and therefore competitiveness, effort under the flat wage may refer to intrinsic motivation. Some previous experimental work has shown that some people will continue to perform even with flat wages, which is traditionally explained by intrinsic motivation (e.g. Dohmen and Falk, 2010; Greiner et al. 2011; Kuhnen and Tymula, 2012; Armentier and Boly, 2011; Charness et al. 2013; Masclet et al. 2015). Intrinsic motivation is generally explained by fairness considerations or a sense of duty to honor contractual obligations (Deci, 1975; Kreps, 1997; James, 2005; Ellingsen and Johannesson 2008; Kuhnen and Tymula 2012). We can therefore reasonably conjecture that effort with flat wages reflects intrinsic motivation in a learning environment. As intrinsic motivation increases the interest in learning at school, our hypothesis is as follows.

Hypothesis 4. *Effort under the flat-wage scheme is correlated with educational performance*

Our last hypothesis concerns potential gender differences across social preferences, and how these may translate into differences in educational achievement. There has been a great deal of work on

gender differences in competitive preferences, showing that men are more competitive than women (Gneezy et al., 2003; Gneezy and Rustichini, 2004; Niederle and Vesterlund, 2007; Vandegrift and Brown 2005; Datta Gupta et al. 2013). There is no clear consensus on gender differences in altruism. Some experimental work finds no significant gender differences (Bolton and Katok (1995); Ben Nér et al. (2004), while in others women are more altruistic than men (Eckel and Grossman, 1997; Dickinson and Tiefenthaler, 2002 and Selten and Ockenfels, 1998). In the context of ultimatum games, the female participants in Guth et al. (2001) are significantly more likely to propose an equal split.¹³ In Andreoni and Vesterlund (2001), women are more altruistic when altruism is costly, while the opposite result holds when it is costless. There is also no clear evidence on gender differences in cooperativeness. In the context of public-goods experiments, some work has concluded that female groups are more cooperative (Nowell and Tinkler, 1994), while others find the opposite (Brown-Kruse and Hummels, 1993).

Based on this previous work, we therefore conjecture that girls are more likely to choose the flat wage, with boys being more attracted by the tournament if they are more competitive. This taste for competition can be reflected in better school achievement, as summarized in Hypothesis 5:

Hypothesis 5. *Boys are more likely to choose the tournament scheme, as they are more competitive, and willingness to compete may translate into better school achievement.*

4. Results

4.1 Variables of interest and descriptive statistics

Our dependent variables refer to school achievement.

School achievement. School achievement is measured by pupils' individual administrative grades: in the French system these go from 0 (the worst) to 20 (the best). We obtained GPA, Mathematics, and History and Geography grades for 422 students, and English grades for 303 pupils.¹⁴ The GPA represents the average of the weighted grades over all of the subjects taught.

¹³ Other studies find no differences in the proposers' offers in the Ultimatum Bargaining Game (Eckel and Grossman, 2001; Solnick, 2001).

¹⁴ One school did not provide us with the grades in English.

Appendix A.4 displays the descriptive statistics for these educational-achievement measurements.

Behavioral measures. Our experimental design allows us to measure four behavioral factors: cooperation, altruism, willingness to compete and intrinsic motivation. Cooperation is measured as the average number of tokens given over the six periods of the repeated VCM, altruism by the number of tokens sent in the modified dictator game, willingness to compete by the choice of the tournament over the flat wage in the real-effort game, and last intrinsic motivation by the real effort (in the decoding task) exerted under the flat wage.

Socio-demographic characteristics. We collected a number of control variables via the school administrations and a post-experimental survey. These variables include gender, birth date, school dummies and parent’s Socio-Economic Status (henceforth SES). The SES variable is a dummy variable for the pupil having at least one parent in the ‘Executives and higher intellectual professions’ or ‘Intermediate professions’.

4.2 The determinants of educational achievement

Our main question is whether the social preferences measured in our experiments are correlated with school performance. Table 2 shows the correlation between our different school-performance and social-preference measures.

Table 2. The correlation between preferences and academic performance

	GPA	Grades in Maths.	Grades in English.	Grades in Hist.-Geo.	Compet.	Altruism	Cooperation	Effort
GPA	1.000							
Grades in Maths.	0.824***	1.000						
Grades in English.	0.786***	0.581***	1.000					
Grades in Hist.-Geo.	0.846***	0.607***	0.609***	1.000				
Compet.	0.133***	0.133***	0.122**	0.090*	1.000			
Altruism	-0.099**	-0.183***	-0.014	-0.087*	-0.050	1.000		
Cooperation	0.040	-0.058	0.075	0.000	-0.016	0.316***	1.000	
Effort	0.234***	0.247***	0.228***	0.128***	0.277***	-0.014	0.056	1.000

^c $p < 0.10$, ^b $p < 0.05$, ^a $p < 0.01$.

Unsurprisingly, most grades are correlated with each other. We also find a significant positive correlation between competitiveness and school achievement. Pairwise correlations also indicate a negative correlation between altruism and school achievement for three out of the four of the latter: GPA, Maths and History-Geography. There is no relationship between cooperation and school achievement. Interestingly, the effort exerted in the real-effort game is positively correlated with grades in all disciplines. Table 2 last shows that altruism is positively correlated with cooperation, while effort is correlated with competitiveness.

To provide more-formal evidence of the relationship between social preferences and grades, we run school-performance regressions. The resulting estimates appear in Tables 3a-3d for GPA, Mathematics, English, and History and Geography grades, respectively.

There are seven GPA regressions in Table 3a, with the GPA being the weighted average grade over all subjects. These are OLS regressions with standard errors clustered at the class level. Column (1) includes only the demographic variables, and columns (2) to (4) competition, altruism and cooperation one at a time. Column (5) then introduces all three behavioral variables at the same time. Last, columns (6) and (7) present separate estimations for the two subsamples of pupils who selected the tournament and the flat wage, respectively. We do so, as the interpretation of effort is different in the two cases: under the tournament it reveals competitiveness and under the flat wage it is rather intrinsic motivation.

Table 3a: Social preferences and the GPA

	(1)	(2)	(3)	(4)	(5)	(6) Compet.	(7) Flat.
Compet.		0.724 ^{***} (0.209)			0.693 ^{***} (0.215)		
Altruism			-0.021 ^{**} (0.010)		-0.024 ^{**} (0.010)	-0.027 (0.016)	-0.015 (0.009)
Coop.				0.017 (0.025)	0.036 (0.027)	0.025 (0.033)	0.041 (0.042)
Effort						0.076 ^{***} (0.025)	0.048 (0.029)

Girl	0.456 (0.287)	0.548* (0.282)	0.512* (0.284)	0.437 (0.295)	0.569* (0.284)	0.364 (0.348)	0.720** (0.346)
SES	1.573*** (0.308)	1.562*** (0.297)	1.553*** (0.304)	1.581*** (0.312)	1.558*** (0.295)	1.919*** (0.420)	1.120*** (0.392)
Constant	13.537*** (0.514)	12.304*** (0.564)	13.877*** (0.527)	13.363*** (0.534)	12.379*** (0.696)	11.213*** (1.113)	10.150*** (0.950)
N	422	422	422	422	422	242	180
R ²	0.105	0.127	0.116	0.107	0.141	0.184	0.167

Significance levels: ***0.01 **0.05 *0.10.

These are OLS regressions. All columns include school dummies. Standard errors are clustered at the class level. Columns (6) and (7) cover the sub-samples of pupils who chose the tournament and the flat wage as the remuneration scheme respectively.

Model 1 includes only demographics as the independent variables. Models 2-5 control for soft skills. In model 1, pupils from a higher SES background have significantly higher GPA scores, which is consistent with previous work underlining the important role of family background. This research has shown that children from poor families have greater difficulty in pursuing their education, and that family income is an important determinant of child school success (Haveman and Wolfe, 1995; Plug and Vijverberg, 2005; Langevin et al., 2017). Beyond the financial domain, parental education may be also an important determinant of child educational attainment, so that education is intergenerationally correlated. This correlation may reflect the inheritance of abilities and preferences from parents. It can furthermore reasonably be argued that more-educated parents place a higher value on education, and are so more likely to encourage their children to become educated. More-educated parents are also more likely to help their children with their schoolwork, and be better informed about the educational system (e.g. by having books around the house), which may reduce the cost of acquiring education (see for instance Ermisch and Francesconi, 2001). As our data contains information on neither parental income nor parents' education, we use parental occupation (SES) as a proxy for the household's financial and educational situation.

Models 2 and 5 show that competitiveness is positively and significantly associated with GPA. After controlling for social preferences, the *girl* variable becomes significantly positive, so that girls outperform boys. In Model 3 there is a significant ($p < 0.05$) negative relationship between altruism and GPA. One possible interpretation is that giving nothing in the dictator game reflects some kind of individual rationality and performance-seeking, which may matter for school

achievement. Last, there is no relationship between cooperation and GPA. This might show that cooperation is not equally-valued in all disciplines, with some putting more weight on cooperative work and others rewarding individual efforts. In Model 5, estimating GPA with all of the social preferences at the same time does not change these results. In Models 6 and 7, the effort exerted (measured by the number of tasks completed) in the tournament settings is correlated with GPA ($p < 0.01$).

The positive significant estimated coefficient on effort under the tournament scheme indicates that those who exert higher effort have better GPA scores. There may plausibly exist a relationship between pupils' ability to decode letters into numbers and school achievement. However, the decoding task was relatively simple and probably does not reflect any particular ability.

Table 3b lists the estimates for the grades in Mathematics. As noted above, GPA is the weighted average over all the subjects taught at school, and we expect that the results will vary by discipline.

Table 3b: Social preferences and Math grades

	(1)	(2)	(3)	(4)	(5)	(6) Compet.	(7) Flat.
Compet.		1.074*** (0.294)			1.014*** (0.300)		
Altruism			-0.043** (0.016)		-0.040** (0.017)	-0.045* (0.023)	-0.025 (0.020)
Coop.				-0.035 (0.038)	-0.003 (0.039)	-0.020 (0.048)	-0.004 (0.060)
Effort						0.126*** (0.028)	0.085* (0.043)
Girl	0.209 (0.401)	0.347 (0.401)	0.328 (0.387)	0.248 (0.412)	0.453 (0.393)	0.114 (0.444)	0.669 (0.605)
SES	1.723*** (0.373)	1.707*** (0.361)	1.683*** (0.375)	1.706*** (0.381)	1.669*** (0.365)	2.250*** (0.611)	0.915 (0.539)
Constant	11.804*** (0.688)	9.974*** (0.768)	12.520*** (0.746)	12.158*** (0.738)	10.772*** (0.937)	10.944*** (1.391)	9.526*** (1.420)
N	422	422	422	422	422	242	180
R ²	0.106	0.128	0.128	0.109	0.147	0.205	0.174

Significance levels: ***0.01 **0.05 *0.10.

These are OLS regressions. All columns include school dummies. Standard errors are clustered at the class level. Columns (7) and (8) cover the sub-samples of pupils who chose the tournament and the flat wage as the remuneration scheme respectively.

As in our previous GPA findings, the taste for competition is positively and significantly associated with Mathematics grades ($p < 0.01$). The effect of competitiveness on Maths grades is

larger than that on the GPA. This echoes the finding in Niederle and Vesterlund (2010) that the willingness to compete is an important determinant of school achievement in STEM disciplines. Altruism attracts a negative significant coefficient ($p < 0.05$). The results in Tables 3a and 3b thus suggest that selfish pupils have better Maths grades. This may show that altruism is a deviation from rational decisions. There are no gender differences in Maths grades, while pupils from higher socioeconomic backgrounds have higher grades.

There is a positive correlation between the effort exerted in the real-effort game and Mathematics grades under both remuneration schemes (respectively, $p < 0.01$ and $p < 0.1$). Each additional letter decoded increases Math grades by 0.126 points for pupils with a taste for competition, and by 0.085 points for those choosing the flat wage.

As noted in Niederle and Vesterlund (2010), Mathematics and GPA might not be representative of all school subjects. Mathematics success requires a specific way of reasoning (with a right or wrong answer).¹⁵ We therefore carry out analogous estimations for English and History-Geography grades. These will allow us to see whether the relationship above between competitiveness and school achievement extends to other disciplines. Table 3c shows the results for English grades.

Table 3c: Social preferences and English grades

	(1)	(2)	(3)	(4)	(5)	(6) Compet.	(7) Flat.
Compet.		1.144*** (0.348)			1.169*** (0.354)		
Altruism			-0.004 (0.011)		-0.009 (0.012)	-0.016 (0.018)	0.004 (0.019)
Coop.				0.038 (0.028)	0.053* (0.027)	0.047 (0.032)	0.032 (0.062)
Effort						0.112** (0.042)	0.045 (0.049)
Girl	0.510 (0.324)	0.685* (0.335)	0.527 (0.304)	0.453 (0.325)	0.648* (0.321)	0.275 (0.373)	0.833* (0.413)
SES	1.407*** (0.377)	1.429*** (0.356)	1.402*** (0.379)	1.416*** (0.372)	1.431*** (0.349)	1.356*** (0.428)	1.429* (0.702)
Constant	15.305***	13.304***	15.364***	14.947***	12.889***	11.533***	12.811***

¹⁵As discussed in Niederle and Vesterlund (2011), teacher gender affects pupils' performance (Dee, 2007; Carrell, Page, and West (2009)). Female Math or Science teachers improve girls' Math and Science grades, with the effect being particularly large for gifted female students.

	(0.527)	(0.797)	(0.628)	(0.608)	(0.938)	(1.402)	(1.743)
N	303	303	303	303	303	183	120
R ²	0.246	0.277	0.246	0.249	0.283	0.293	0.361

Significance levels: ***0.01 **0.05 *0.10.

These are OLS regressions. All columns include school dummies. Standard errors are clustered at the class level. Columns (7) and (8) cover the sub-samples of pupils who chose the tournament and the flat wage as the remuneration scheme respectively.

The estimated competitiveness coefficient continues to be positive and significant for English grades ($p < 0.01$): choosing the tournament over the flat wage increases English grades by 1.144 points. Surprisingly, this coefficient is larger than that for Mathematics in Table 3b. Cooperation attracts a positive significant coefficient ($p < 0.1$), while altruism is not significantly correlated with English grades. One potential interpretation is that performance in literature or English may require some kind of social intelligence, which is picked up by the “average cooperation” variable. As found above, parental SES is positively and significantly correlated with grades. Models 6 and 7 show the separate sub-sample estimates by the chosen remuneration scheme. There is a positive relationship between effort in the tournament sample and English achievement ($p < 0.05$), but no significant correlation in the flat-wage sample.

We last consider the effects of soft skills on History-Geography grades in Table 3d.

Table 3d: Social preferences and History-Geography grades

	(1)	(2)	(3)	(4)	(5)	(6) Compet.	(7) Flat.
Compet.		0.570* (0.278)			0.524* (0.293)		
Altruism			-0.031*** (0.011)		-0.032** (0.012)	-0.037* (0.020)	-0.026* (0.014)
Coop.				-0.005 (0.036)	0.021 (0.038)	0.014 (0.051)	0.030 (0.056)
Effort						0.054 (0.033)	0.054 (0.043)
Girl	0.619 (0.390)	0.692* (0.382)	0.704* (0.391)	0.625 (0.398)	0.752* (0.388)	0.702 (0.491)	0.728* (0.408)
SES	2.175*** (0.484)	2.167*** (0.476)	2.146*** (0.475)	2.173*** (0.489)	2.147*** (0.472)	2.510*** (0.629)	1.724** (0.651)
Constant	13.460*** (0.944)	12.489*** (0.955)	13.972*** (0.907)	13.510*** (0.990)	12.893*** (1.113)	11.404*** (1.488)	10.197*** (1.509)
N	422	422	422	422	422	242	180
R ²	0.129	0.137	0.143	0.129	0.150	0.172	0.149

Significance levels: ***0.01 **0.05 *0.10.

These are OLS regressions. All columns include school dummies. Standard errors are clustered at the class level. Columns (7) and (8) cover the sub-samples of pupils who chose the tournament and the flat wage as the remuneration scheme respectively.

Competitiveness is less significant in Table 3d than in other disciplines ($p < 0.1$). The “altruism” variable attracts a negative significant coefficient ($p < 0.05$). There is no correlation between cooperation and History and Geography grades. Last, as for the other subjects, “High SES” is positive and significant. We tested the robustness of our findings to an alternative specification where we consider standardized grades at the class level instead of the raw grades as a measure of school achievement to take into account potential differences in teacher marking practices by ranking each pupil in terms of the class distribution. These estimates (available upon request) provide very similar findings are available upon request.¹⁶ Our main findings are summarized in Result 1.

Result 1. *a) Willingness to compete significantly influences all grades, although the effect is smaller for History and Geography. b) Altruism has a negative impact on grades (except for English). c) Effort in the flat wage (as a proxy for intrinsic motivation) weakly explains higher grades in Mathematics d) Girls perform better than boys in all grades after controlling for social preferences (except in Mathematics, where no gender difference is found). e) Higher parental SES is associated with better grades*

4.3 Gender differences in educational achievement

Our findings above revealed gender differences in educational achievement. Girls seem to be more successful in most subjects, except for Mathematics where the gender difference is not statistically significant. This is consistent with previous findings showing that girls tend to have higher grades than boys (Terrier, 2020).

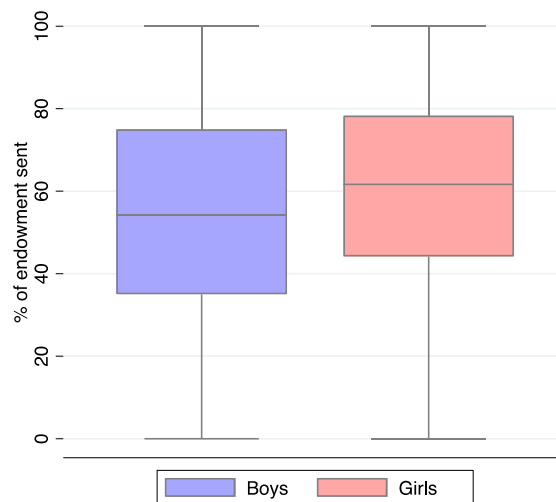
In this current sub-section, we investigate the determinants of these gender differences. We first test whether social preferences differ by gender, and then whether these social preferences affect boys’ and girls’ educational attainment differently by running separate regressions by gender.

4.3.1. Gender differences in social preferences

¹⁶ Precisely we used z-score grades at the class level: $\frac{X_{\{ik\}} - \bar{x}_{\{jk\}}}{\sigma_{\{jk\}}}$, where $X_{\{ik\}}$ is the grade of individual i in subject k , $\bar{x}_{\{jk\}}$ the class j average in subject k , and $\sigma_{\{jk\}}$ the grade distribution for class j in subject k . These estimates (available upon request) provide very similar findings are available upon request.

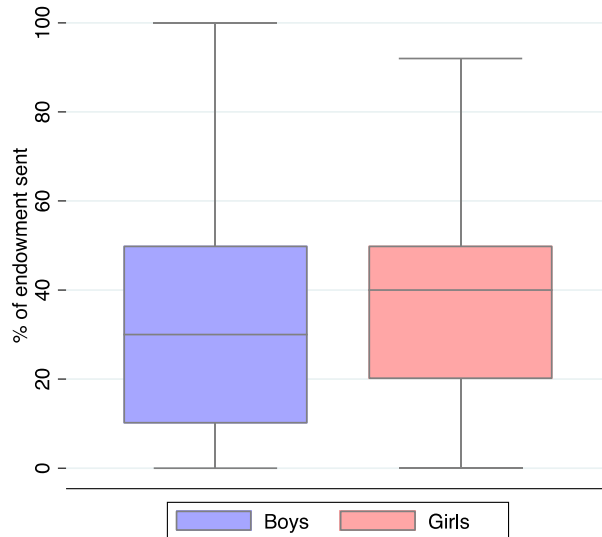
We first consider gender differences in cooperativeness in the repeated public-good game. Figure 1 depicts the average number of tokens sent in the six periods in the VCM (*i.e.* average cooperation). Pupils give on average 11.5 tokens (out of the 20 they start with), and girls and boys respectively 11.9 and 10.9 tokens. A Mann-Whitney test reveals that girls cooperate more than boys ($z = -2.10$, $p = 0.036$).

Figure 1: Cooperation by gender (the amount contributed to the group account)



The gender differences in altruism (proxied by the amount sent in the modified dictator game) appear in Figure 2.

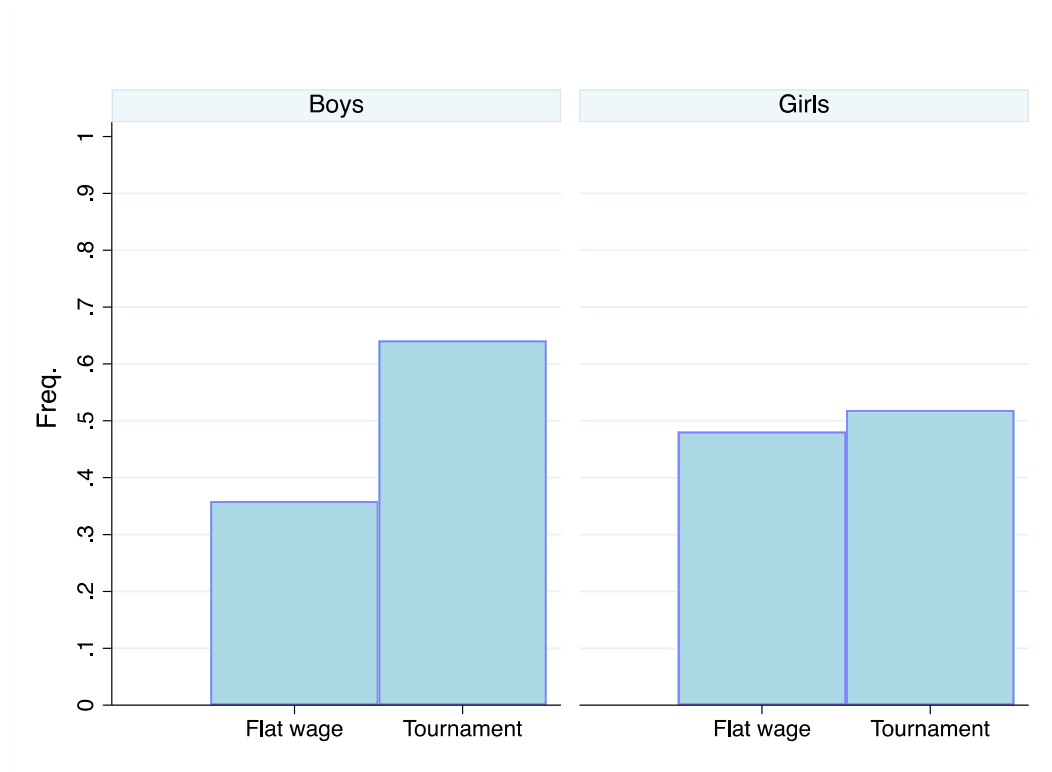
Figure 2: The amount sent in the modified dictator game by gender



Pupils on average send 35.6% of their initial amount. There are some gender differences in Figure 2: girls are more likely to give (37.8% of their endowment) than are boys (32.9%). A Mann-Whitney test shows that this gender difference is significant ($z = -1.94$, $p = 0.053$). This finding is consistent with Sutter et al. (2019).

Figure 3 displays the gender difference in competitiveness (as measured by the choice between the tournament and the flat wage).

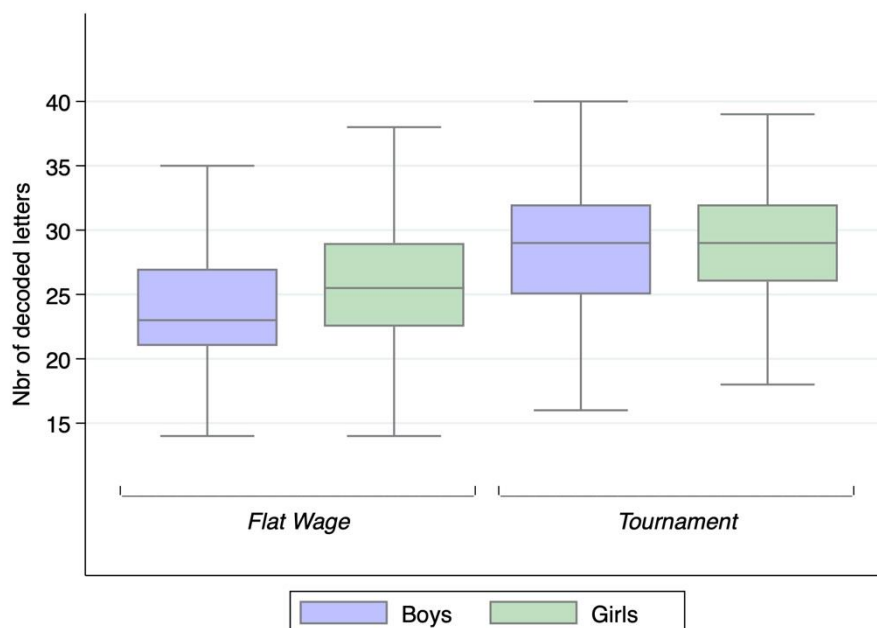
Figure 3: Competitiveness as the choice of remuneration scheme by gender



On average 57.4% of pupils chose the tournament. Figure 1 shows that there are gender differences in the willingness to compete: while 63.6% of boys choose the tournament only 52.1% of girls did. A Mann-Whitney test indicates that this difference is statistically significant ($Z=2.41$, $p=0.016$), which is consistent with Hypothesis H5 and previous findings using more traditional participant pools (Gneezy *et al.*, 2003; Gneezy and Rustichini, 2004; Vandegrift and Brown, 2005; Datta Gupta *et al.*, 2005; Niederle and Vesterlund, 2007; Datta Gupta *et al.*, 2013), and among children (Sutter and al (2019)).¹⁷

In addition to social preferences, we also analyze gender differences in the effort exerted in the real task under both remuneration schemes. As discussed above, real effort might reflect some kind of intrinsic motivation. Figure 4 shows the average effort figures by gender under each remuneration scheme.

Figure 4: Letters decoded by remuneration scheme and gender



Pupils decoded an average of 28.3 letters ($sd = 6.99$) in the tournament scheme, and 24.3 letters

¹⁷ We notably find that pupils in our sample are more likely to enter the tournament than in other analyses. For instance, Sutter and Glätzle-Rützler (2015) report that 40% of boys chose to compete in a Math task and 19% of girls, in a sample of 9–18 year-olds. Buser *et al.* (2014) show that 15 year-old girls have a 23 percentage-point lower probability of choosing the tournament. In Almás *et al.* (2016), over 50% of boys aged 14–15 compete while only 32% of girls do so.

(sd=6.51) under the flat wage. This difference is significant using a Mann-Whitney test: choosing the tournament is associated with higher effort ($z=-7.128$, $p= 0.00$), which corroborates previous experimental work with traditional subject pools. Moreover, a Mann-Whitney test shows that this better performance under the tournament is found for both boys ($z =-5.72$, $p = 0.000$) and girls ($z= -4.49$, $p = 0.00$).

Regarding gender differences, boys decode an average of 28 letters and girls 28.6 in the tournament. A Mann-Whitney test indicates that this difference is not significant ($Z = 0.514$, $p = 0.608$), suggesting that girls perform as well as boys in the tournament. However, Figure 2 shows that girls exert significantly greater effort than boys under flat wages, with respective figures of 25.3 and 22.9 letters (Mann-Whitney test, $Z=2.607$, $p =0.008$). This is consistent with girls having stronger intrinsic motivation than boys.

We provide a more-robust analysis of these findings via the econometric analysis of the determinants of each of these three behaviors. The estimates in Table 4 show how demographic characteristics affect competitiveness, cooperativeness, and altruism.

Columns 1 to 3 of table 4 show probit estimates of the probability of entering the tournament. Columns 4-6 then list OLS estimates of the tokens sent in the modified dictator game. To control for left-censored observations, column (7) shows Tobit estimates as a robustness check. Columns 8 and 9 display the OLS estimates of the average contribution to the group account in the VCM. Last, columns 10 and 11 refer to OLS effort estimates (*i.e.* the number of letters decoded) in the flat wage and the tournament, respectively.

Table 4. Determinants of social preferences and effort

	Competitiveness			Altruism			Cooperation		Effort		
	(1) All GLS	(2) All GLS	(3) All GLS	(4) All GLS	(5) All GLS	(6) All GLS	(7) All Tobit	(8) All GLS	(9) All GLS	(10) Flat.	(11) Compet.
Girl	-0.333*** (0.126)	-0.317** (0.127)	-0.318** (0.127)	2.745** (1.195)	2.556** (1.207)	1.714 (1.154)	3.304** (1.308)	1.099** (0.481)	0.754* (0.452)	2.533*** (0.971)	0.632 (0.881)
SES	0.037 (0.150)	0.031 (0.150)	0.032 (0.150)	-0.928 (1.384)	-0.907 (1.383)	-0.547 (1.327)	-2.323 (1.467)	-0.465 (0.578)	-0.346 (0.556)	0.091 (1.226)	-0.007 (1.215)
Altruism		-0.006 (0.005)	-0.007 (0.005)						0.130*** (0.019)	0.026 (0.046)	-0.050 (0.035)
Coop.			0.002 (0.013)			0.776*** (0.116)				-0.093 (0.095)	0.209*** (0.080)
Compet.					-1.476 (1.221)	-1.392 (1.144)			0.083 (0.452)		
Constant	0.882*** (0.238)	0.984*** (0.253)	0.965*** (0.275)	15.201*** (2.189)	17.915*** (3.276)	9.967*** (3.133)	12.816*** (2.194)	10.051*** (0.924)	7.929*** (1.204)	19.863*** (2.398)	24.165*** (2.012)
Observations	422	422	422	422	422	422	422	422	422	180	242
R ²				0.043	0.047	0.143		0.017	0.116	0.072	0.053
Log Likelihood	-281.153	-280.378	-280.362	-1645.463	-1644.699	-1622.362	-1570.838	-1267.121	-1244.759	-579.389	-809.112

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Columns (1) to (3) display the determinants of choosing the tournament as a remuneration scheme based on a probit estimate. The dependent variable is equal to one if the participant chose the tournament. Columns (4) to (7) are based on OLS (4 to 6) and Tobit estimates (7) to document the determinant of altruism. The dependent variable is the number of tokens sent in the MDG. The dependent variable in columns (8) and (9) is the average number of tokens given in the VCM based on OLS estimates. Columns (10) and (11) display the determinants of the number of letters decoded in the real effort task for each remuneration scheme, the flat wage and the tournament respectively. All standard errors are robust.

Table 4 confirms our previous findings that girls shy away from competition as compared to boys who are more likely to choose the tournament ($p < 0.05$). Girls are also more cooperative and altruistic than boys as shown in columns 4 to 10, and 9 – 10, respectively. Finally, regarding effort, girls expend greater effort than boys in the flat-wage setting while there are no gender differences in the tournament. These findings are summarized in Result 2.

Result 2. *a) Boys are more likely to choose the tournament than girls. b) Girls are more likely to give positive amounts in the modified dictator game. c) Girls are more cooperative than boys in the VCM. d) Girls outperform boys in the flat wage scheme.*

4.3.2. The role of gender differences in social preferences in educational attainment

The analysis above yields rather counter-intuitive and paradoxical findings. We might expect boys to have better grades than girls as they are more competitive and less altruistic, and we know that competitiveness (altruism) positively (negatively) affects educational performance. One possible explanation of this paradox is that girls are more intrinsically motivated than boys. However intrinsic motivation, captured by effort in the flat wage, is only weakly correlated with educational performance in Mathematics and is not significant for other subjects. A more-plausible explanation is that social preferences affect educational performance differently for girls and boys. To evaluate this possibility, we carry out separate estimates by gender of the role of social preferences in educational attainment: the results appear in Table 5.

Table 5 Social preferences and grades by gender

	GPA		Math		English		Hist.-Geo.	
	(1) Girl	(2) Boy	(3) Girl	(4) Boy	(5) Girl	(6) Boy	(7) Girl	(8) Boy
Compet.	0.522* (0.264)	0.968** (0.364)	0.755* (0.400)	1.423** (0.556)	1.019*** (0.340)	1.435** (0.595)	0.467 (0.357)	0.575 (0.412)
Altruism	-0.012 (0.014)	-0.033** (0.014)	-0.014 (0.019)	-0.063** (0.025)	-0.006 (0.021)	-0.010 (0.020)	-0.014 (0.017)	-0.046** (0.017)
Coop.	0.016 (0.036)	0.059 (0.041)	-0.056 (0.043)	0.058 (0.063)	0.037 (0.035)	0.059 (0.039)	-0.003 (0.047)	0.056 (0.063)
SES	1.224*** (0.325)	1.940*** (0.365)	1.226*** (0.419)	2.241*** (0.514)	1.058** (0.488)	1.883*** (0.536)	1.531*** (0.497)	2.879*** (0.598)
Constant	13.993*** (0.620)	11.581*** (1.020)	12.587*** (0.883)	10.922*** (1.436)	14.901*** (0.798)	12.418*** (1.257)	14.405*** (0.780)	11.995*** (1.418)
N	232	190	232	190	160	143	232	190
R ²	0.117	0.198	0.135	0.203	0.339	0.251	0.097	0.229

Significance levels: ***0.01 **0.05 *0.10.

These are OLS regressions. All columns include school dummies. Standard errors are clustered at the class level.

Table 5 indicates that social preferences do indeed affect school performance differently by gender. There is a positive significant relationship between competitiveness and school achievement for both genders in most subjects (except History and Geography). However, competitiveness plays a larger and more-significant role for boys than for girls in most academic subjects. The negative role of altruism on educational achievement is only significant for boys and for GPA, Maths and Hist-Geo grades. We further explore the relationship between behavioral inputs and grades by running separate estimates for each remuneration scheme in Appendix A-4a. These additional estimates do not produce a clear pattern. We in addition replicate Table 5 in Appendix A-4b and include the effort variable in order to test the hypothesis that motivation may differ in respect to gender and the remuneration scheme chosen. While the coefficient is positive and significant, we cannot distinguish the role of competitiveness from that of motivation as they are strongly correlated.

These findings overall suggest that social preferences affect boys' and girls' educational attainment differently, as summarized in Result 3.

Result 3. *a) The role of competitiveness on educational attainment is significantly larger for boys than for girls in most subjects. b) The negative role of altruism on educational achievement is only significant for boys.*

5. Conclusion

The relationship between behavioral measures and children's educational achievement has received growing attention in recent decades (Lavecchia et al., 2016; Levitt et al., 2016; Koch et al., 2015). While most of this literature has focused on the role of time preferences, habits, information or beliefs (Castillo et al., 2011; Sutter et al., 2013), less is known about how social preferences are related to educational attainment.

We have here contributed to this literature by running an original lab in the field experiment in French Middle Schools to see the extent to which *i*) willingness to compete, *ii*) cooperation, *iii*) altruism and *iv*) intrinsic motivation are correlated with children's educational attainment.

We have five main findings.

First, the willingness to compete is a significant determinant of school achievement in most of the subjects we analyze: more-competitive pupils have better grades. We do however find differences across subjects. For example, competitiveness matters more in Mathematics and English than in History and Geography.

We second find a robust negative relationship between altruism and school achievement. Although this finding at first glance may seem surprising, as we may expect altruism to reflect social intelligence, this is in line with previous research suggesting a positive relationship between cognitive abilities and selfishness: high-performing school pupils share less in dictator games. One possible interpretation is that altruism, measured here by the amount sent in the modified dictator game, may reflect their rationality as players deviate from the Nash equilibrium (the dictator should give nothing to the other player). We here find differences across subjects, as altruism does not affect grades in English while it does so significantly in the other disciplines.

Third, greater effort in the real decoding task under the flat wage is positively correlated with Mathematics grades. We can interpret this finding in terms of intrinsic motivation. Note however that effort does not seem to explain grades in the other subjects that we analyze in this experiment.

Fourth, some demographics matter for educational attainment. Consistent with previous work, family background has a positive and significant effect on educational attainment in all subjects (Haveman and Wolfe, 1995; Plug and Vijverberg, 2005; Langevin et al., 2017). Furthermore, after controlling for social preferences, girls outperform boys in all subjects (except in Mathematics, where there are no gender differences).

Fifth, there are considerable gender differences in social preferences. Girls are less likely to choose the tournament as compared to boys, but are more altruists than boys and more cooperative than boys in the VCM. Last, girls outperform boys under the flat-wage scheme. Gender differences in grades seem to be explained by the role of competitiveness on educational attainment being significantly larger for boys than for girls, while the negative role of altruism on educational achievement is only significant for boys.

A first natural extension of this study would be to provide a better understanding of the observed differences across subjects that we find. A second would consist in testing whether our results hold considering other personality traits or alternative school-achievement measures. Last, it would be of interest to check whether our school-level findings translate into different outcomes in the labor market.

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Appendix

A.1. Lab-in-the field



A.2 Randomization

The size of our lab did not permit the entire class to participate in the experiment. To ensure the representativeness of our analysis, we randomized participation at the class level. The table below lists the distribution of a number of individual characteristics to show that the randomization worked.

Descriptive statistics for participants and non-participants

Variable	(1) Non-participants	(2) Participants	(3) Difference in means
Gender	0.366	0.586	0.220***
1 = girl; 0 = boy	(0.483)	(0.493)	(0.045)
Scholarship	0.171	0.000	-0.171***
1 = pupils have public scholarship as parents' income is below a threshold	(0.377)	(0.000)	(0.018)
Farmers, Craftsmen, traders, and business leaders	0.034	0.040	0.005
1 = one parent has this job	(0.183)	(0.195)	(0.019)
Executives and higher intellectual professions	0.110	0.143	0.033
1 = one parent has this job	(0.314)	(0.351)	(0.033)
Intermediate professions	0.145	0.141	-0.004
1 = one parent has this job	(0.353)	(0.348)	(0.034)
Employees	0.297	0.267	-0.030
1 = one parent has this job	(0.458)	(0.443)	(0.043)
Workers	0.262	0.291	0.029
1 = one parent has this job	(0.441)	(0.455)	(0.044)
Retired	0.000	0.002	0.002
1 = one parent is retired	(0.000)	(0.050)	(0.004)
Unemployment	0.152	0.116	-0.036
1 = one parent is unemployed	(0.360)	(0.321)	(0.032)
Observations	164	423	

A.3 Instructions

You are participating in an economics experiment where the goal is to win as many tokens as possible, and these tokens will provide you with gifts. The tokens you win will depend on your choices and those of other players. During the experiment, you must not talk to any of your classmates. If you speak to them, you will not be able to play, and you will not receive any tokens. If you have any questions, raise your hand, and we will come and answer them.

There are four different games in this experiment: the first two last for six games each, and the final two games are one game each.

You will use a number pad throughout the experiment. Use the C key to erase what you have entered.

- We will give you 20 tokens for your participation.

First game: a repeated VCM game played during 6 periods

You are part of a group of 4 players; you do not know with whom you are playing. You can choose to participate in a group project, *i.e.* to put tokens into a group account. The tokens given to the group account are equally shared among the group members.

This game consists of 6 identical periods. The rules of each period are as follow:

- At the beginning of each period, you receive 20 tokens.

The game consists in participating in a joint project in which everyone decides how many tokens from 0 to 20 they want to put in a common group account without knowing what the others will give. When everyone has made their choice, the screen displays the number of tokens in the group account and the number of tokens you have won.

Your payoff depends on two parts:

- The tokens you kept for yourself (20 tokens - your stake).
- The tokens sent to the group account by all of the group members. Each player receives half of the total amount of tokens assigned to the group account.

The number of tokens you win at the end of the game is equal to the number of tokens you kept plus half of the tokens in the group account.

For example, if each of the four players puts 20 tokens into the group account, the total amount in the group account will be 80 tokens ($20 \times 4 = 80$). Each player gets half of this amount ($40 = 80 \div 2$) plus the tokens they kept (in this game, 0 tokens). Everyone thus earns 40 tokens at this period of the game. Conversely, if each of the four players puts 0 tokens in the group account, each player gets half of the tokens in the group account (*i.e.* 0 tokens) plus the number of tokens they have kept for themselves (*i.e.* 20 tokens). So everyone earns 20 tokens.

For example, if you put ten tokens in the group account and the other three players put 20 tokens each in the group account, the total amount in the group account is 70 tokens ($10 + 20 \times 3 = 70$). Each player gets half of the tokens in the pot ($35 = 70 \div 2$) plus the tokens they have kept. In your case, you have won 35 tokens from the group account plus the ten tokens you kept for yourself. You have won 45 tokens.

Before you start, you will answer a few understanding questions.

The tokens you give to the group account increase the payoffs of all players in the group. This game lasts ten periods. In each period you will have to decide how much to send to the group account and how much to keep for yourself.

To calculate what you win in this game, we will randomly draw one of the six periods.

Second game: dictator game

In this game you will play with another player. You do not know the identity of this player. You receive 50 tokens while the other player gets 0 tokens. You can choose to increase the other player's payoff by giving her some of your tokens (between 0 and 50 tokens).

At the same time, another player will play with you. He gets 50 tokens, and you get 0 tokens. She can choose to increase your payoff by giving you some of her tokens. When you decide how much to give to someone you will not know how many tokens the other player has chosen to give to you. Important: the player who gives tokens to you is not the same player that receives tokens from you.

Your winnings will be: 50 tokens - what you give to the other player + what another player gives to you.

Third game: real effort game under a fixed remuneration or a tournament scheme

You will now participate in a new game where you will have to complete a task. You will see a table on the left side of your screen. The first column contains letters and the second column numbers. Each row shows the number corresponding to a letter. You will have to decode these letters into numbers.

A letter appears in the middle of your screen. You have to look at the number corresponding to the letter in the table. Then you type in the number. If you are wrong, you have to start over until you

The screenshot shows a game interface with a table on the left and a decoding input area on the right. The table maps letters to numbers. The input area shows the letter 'H' and a numeric keypad with buttons for digits 1-9, 0, and 'C', along with an 'OK' button. A timer at the top right indicates 'Remaining time [sec]:11'. At the bottom, a counter shows 'Nombre de lettres que tu as déjà décodé : 0'.

Lettre	Nombre
B	19
I	16
D	2
L	26
Y	5
E	22
H	1
W	18
N	4
F	12
P	10
R	9
Q	8
J	6
Z	20
U	17
O	3
X	21
C	7
K	14
A	24
T	11
V	15
M	25
G	13
S	23

enter the correct answer. You have three minutes to decode as many letters as you can.

Before the decoding task, you have to choose your payment scheme. You can choose between a fixed number of tokens (this means that your payoff does not depend on the number of letters you decode) or a tournament (your payoff depends on your performance and the performance of someone else). You will then play the same task for three minutes.

If you choose a fixed payoff, you win 50 tokens regardless of the number of letters you decode. If you decode 0, 5, 10, 20, or any number of letters, you will always win 50 tokens.

If you choose the tournament, you compete with another player in the room (you do not know her/his identity). At the end of the three minutes, the number of letters decoded is compared to the number of letters decoded by the other player. Your payoff is then calculated as follows:

- You win 80 tokens if you have decoded more letters than the other player.
- You win 20 tokens if you have decoded fewer letters than the other player.

Before you start, you will answer few understanding questions.

You will now take a quiz. This will only take a few minutes.

A.4 Descriptive Statistic on educational achievement measurements

	Obs.	Average	Sd dev	Min	Max
GPA	422	13.99735	2.370538	7.33	18.92
Grades in Math	422	13.77699	3.519558	2.25	19.91
Grades in Hist. Geo.	422	13.97166	3.194353	2.75	20
Grades in English	303	14.42987	3.14022	5.78	19.73
Observations	422				

A-5a – Grades by remuneration scheme and gender

	GPA				Maths				English				History and Geography			
	Flat Wage		Compet.		Flat wage		Compet		Flat wage		Compet		Flat wage		Compet	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	Girl	Boy	Girl	Boy	Girl	Boy	Girl	Boy	Girl	Boy	Girl	Boy	Girl	Boy	Girl	Boy
Altruism	-0.005 (0.015)	-0.025 (0.027)	-0.016 (0.033)	-0.039** (0.017)	0.016 (0.016)	-0.078 (0.046)	-0.033 (0.041)	-0.059* (0.031)	0.011 (0.031)	0.004 (0.027)	-0.025 (0.043)	-0.013 (0.023)	-0.012 (0.022)	-0.035 (0.029)	-0.015 (0.039)	-0.054** (0.022)
Coop.	0.015 (0.049)	0.109** (0.047)	0.028 (0.066)	0.047 (0.045)	-0.063 (0.066)	0.148 (0.086)	-0.041 (0.075)	0.036 (0.073)	-0.024 (0.084)	0.155 (0.093)	0.092 (0.078)	0.046 (0.043)	-0.003 (0.071)	0.137* (0.073)	0.014 (0.081)	0.036 (0.070)
SES	0.743 (0.515)	1.858*** (0.616)	1.749*** (0.399)	2.039*** (0.576)	0.425 (0.751)	2.116** (0.779)	2.104*** (0.673)	2.415*** (0.835)	0.626 (0.755)	3.209** (1.365)	1.459* (0.735)	1.400** (0.573)	1.180 (0.722)	2.759*** (0.935)	1.943*** (0.652)	3.009*** (0.844)
Constant	14.401*** (0.809)	11.184*** (0.975)	14.706*** (0.534)	13.448*** (0.737)	13.075*** (0.892)	11.332*** (1.500)	15.918*** (0.600)	14.861*** (1.193)	16.355*** (1.490)	12.302*** (1.025)	16.731*** (0.874)	13.869*** (0.638)	14.613*** (0.819)	10.326*** (1.457)	14.929*** (0.807)	12.025*** (1.130)
N	113	67	119	123	113	67	119	123	75	45	85	98	113	67	119	123
r2	0.111	0.192	0.157	0.168	0.169	0.259	0.170	0.169	0.377	0.363	0.323	0.195	0.048	0.311	0.149	0.199

Significance levels: ***0.01 **0.05 *0.10. These are OLS regressions and all columns include school dummies.

A-5b - Grades by remuneration scheme, gender including the variable Effort

	GPA		Maths		English		Hist & Geo	
	(1) Girl	(2) Boy	(3) Girl	(4) Boy	(5) Girl	(6) Boy	(7) Girl	(8) Boy
Compet.	0.334 (0.276)	0.589 (0.375)	0.426 (0.424)	0.844 (0.591)	0.629* (0.340)	0.985 (0.569)	0.369 (0.382)	0.138 (0.446)
Altruism	-0.012 (0.012)	-0.031** (0.014)	-0.014 (0.017)	-0.059** (0.023)	-0.006 (0.019)	-0.009 (0.018)	-0.014 (0.016)	-0.043** (0.016)
Coop.	0.018 (0.035)	0.044 (0.040)	-0.053 (0.043)	0.036 (0.060)	0.034 (0.037)	0.045 (0.038)	-0.002 (0.047)	0.039 (0.064)
Effort	0.059** (0.026)	0.073** (0.027)	0.104*** (0.028)	0.112*** (0.035)	0.087* (0.042)	0.089* (0.042)	0.031 (0.033)	0.085** (0.037)
SES	1.246*** (0.330)	1.914*** (0.384)	1.264*** (0.420)	2.202*** (0.505)	0.962* (0.501)	1.821*** (0.539)	1.542*** (0.511)	2.850*** (0.640)
Constant	12.697*** (0.806)	10.250*** (1.114)	10.312*** (0.932)	8.885*** (1.490)	13.245*** (1.162)	11.016*** (1.683)	13.731*** (0.981)	10.455*** (1.411)
N	232	190	232	190	160	143	232	190
r2	0.144	0.239	0.175	0.245	0.366	0.287	0.101	0.258

Significance levels: ***0.01 **0.05 *0.10. These are OLS regressions and all columns include school dummies.

